OXFORD MEDICAL PUBLICATIONS

A SYSTEM OF OPERATIVE SURGERY

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A SYSTEM OF OPERATIVE SURGERY

BY VARIOUS AUTHORS

EDITED BY

F. F. BURGHARD, M.S. (LOND.), F.R.C.S. (ENG.)

LECTURER ON SURGERY AND SURGEON TO KING'S COLLEGE HOSPITAL
CONSULTING SURGEON TO THE CHILDREN'S HOSPITAL, PADDINGTON GREEN

IN FIVE VOLUMES

VOL. V

OPERATIONS UPON THE FEMALE GENITAL ORGANS

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EDITOR'S PREFACE

GREAT as have been the advances made in Surgery during the last fifteen years, there is no direction in which they have been more noticeable than in the elaboration of those comparatively small but important details of operative technique which do so much to ensure a low mortality and a successful result.

These improvements have been developed simultaneously throughout the whole of the vast field covered by modern Surgery, and it has become increasingly difficult for any single writer to deal with such an important subject as Operative Surgery in an authoritative and efficient manner. The scope of the subject is so wide that it is difficult to ensure that the work when published shall be thoroughly up to date, while a second and even greater difficulty is for any one, however great his ability and experience, to deal equally exhaustively and authoritatively with all of the many branches of which he would have to treat.

To avoid both of these difficulties and thus to make sure that the work shall reflect faithfully the present position of British Operative Surgery, the plan has been adopted of securing the co-operation of a number of prominent British Surgeons. Each writer deals with a branch of the subject in which he has had special experience, and upon which, therefore, he is entitled to speak with authority.

Besides the two important points just referred to, a third equally important one has been kept in view throughout. Particular care has been taken to make the work of as much practical utility to the reader as possible. Not only are the various operations described in the fullest detail and with special

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PREFACE TO VOLUME V

THE widely different nature of the subjects which were grouped together in Vol. IV of the former edition of this work makes it reasonable to suppose that the convenience of readers will be promoted by separating the operations upon the Female Genital Organs from those upon the organs of special sense. They have therefore been transferred to a new volume in the compilation of which several fresh authors have assisted, and advantage has been taken of this fact to allocate a more generous share of space to this subject than was possible in the former edition.

reference to the difficulties and dangers and the best methods of overcoming and avoiding them, but the indications for the individual operations are described at length, and the after-treatment and results receive adequate notice.

It is therefore hoped that the work will be useful alike to those who are about to operate for the first time, and to those surgeons of experience who desire to keep themselves informed as to the progress that has been made in the various branches of Operative Surgery.

The division of the work into a number of sections each written by a different author, necessarily involves some overlapping of subjects and some diversity of opinion upon points of technique. Efforts have been made to prevent overlapping of subjects as far as possible by care in their distribution and by conference between the authors concerned, but no attempt has been made to harmonize conflicting views. Each author supports his individual opinions by the weight of his authority, and any discrepancies may be taken to represent the absence of unanimity on various minor points that is well known to exist among surgeons of all countries.

The task of editing a work contributed to by so many writers might well appear to be an onerous one, but, owing to the promptitude, courtesy, and forbearance of all concerned, it has been a source of great pleasure, and the Editor's most cordial thanks are tendered to all those who have devoted so much time and trouble to the work.

W. BLAIR BELL, M.D., B.S. (Lond.)

Gynæcological Surgeon, with charge of Out-patients, Royal Infirmary, Liverpool

Operations upon the Uterine Tubes

R. D. MAXWELL, F.R.C.S. (Eng.)

Assistant Obstetric Physician to the London Hospital; Physician to Queen Charlotte's Lying-in Hospital

Operations for Ectopic Gestation

A. W. W. LEA, M.D. (Lond.), F.R.C.S. (Eng.)

Surgeon, Northern Hospital for Women and Children, Manchester; Assistant Surgeon, St. Mary's Hospital, Manchester

Operations for Puerperal Sepsis

CONTRIBUTORS TO THIS VOLUME

HENRY RUSSELL ANDREWS, M.D., B.S. (Lond.), F.R.C.P.
Obstetric Physician to the London Hospital

The General Preparation of Patients for Gynæcological Operations

SIR JOHN BLAND-SUTTON, F.R.C.S. (Eng.)
Surgeon to the Middlesex Hospital

The After-treatment, Risks, and Sequelæ of Abdominal Gynæcological Operations

Operations for Non-malignant Affections of the Uterus

Operations for Diseases of the Ovary

JOHN PHILLIPS, M.A., M.D. (Cantab.), F.R.C.P.
Professor of Obstetric Medicine, Obstetric Physician and Gynæcologist, King's College Hospital

Operations upon the Vulva, Perineum, and External Genital Organs

C. A. LEEDHAM-GREEN, Ch.M. (Birm.), F.R.C.S. (Eng.)
Surgeon to the Queen's Hospital, Birmingham

Operations upon the Female Bladder and Urethra

VICTOR BONNEY, M.S. (Lond.), F.R.C.S. (Eng.)
Assistant Gynæcological Surgeon to the Middlesex Hospital, Surgeon to the Chelsea Hospital for Women

Operations for Malignant Disease of the Uterus and Cervix

HENRY JELLETT, M.D., F.R.C.P.I.
Master of the Rotunda Hospital, Dublin

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Obstetric Physician to the London Hospital.

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Surgeon, Queen's Hospital, Birmingham.

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By JOHN PHILLIPS, M.A., M.D. (Cantab.), F.R.C.P.

Professor of Obstetric Medicine, Obstetric Physician and Gynæcologist, King's College Hospital.

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Assistant Gynæcological Surgeon, Middlesex Hospital; Surgeon, Chelsea Hospital for Women.

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Master, Rotunda Hospital, Dublin.

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Surgeon to the Middlesex Hospital.

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Assistant Obstetric Physician to the London Hospital; Physician to Queen Charlotte's Lying-in Hospital.

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Surgeon, Northern Hospital for Women and Children, Manchester; Assistant Surgeon, St Mary's Hospital, Manchester.

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By W. BLAIR BELL, M.D., B.S (Lond)
Gynæcological Surgeon, with charge of Out-patients, Royal Infirmary, Liverpool.

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HENRY RUSSELL ANDREWS, M.D., B.S. Lond., F.R.C.P.,

Obstetric Physician to the London Hospital.

CHAPTER I

THE GENERAL PREPARATION OF PATIENTS

PREPARATION OF THE PATIENT FOR GYNÆCOLOGICAL OPERATIONS

THE preparation of the patient for a gynæcological operation should begin, if possible, forty-eight or thirty-six hours before the operation. The pulse-rate and the temperature should be noted on two or three occasions. The urine must be examined if this has not been done before. If the patient suffers from a cough the operation must be postponed for a few days at least. It is important that the bowels should be thoroughly emptied before the operation, as the amount of discomfort which the patient must suffer is increased if for any reason this preliminary preparation has been neglected, and there is no doubt that auto-intoxication may occur from a loaded intestine. When possible, an aperient should be given the last night but one before the operation; an enema of soap and water the night before the operation. If the preparation cannot be begun until the day before the operation, half an ounce to an ounce of castor oil should be given not later than 3 p.m., so that its action shall be over in time for the patient to get an undisturbed night's rest. It is sometimes necessary to give an enema on the morning of the operation, but it is best to give it not later than ten o'clock the night before, as an enema on the morning of the operation sometimes takes a good deal out of the patient. If the operation is not to be performed until the afternoon, there is no objection to the giving of an enema in the early morning. It is not enough that the bowels are opened, they must be opened several times in the forty-eight hours preceding the operation. If the patient suffers from chronic constipation, it may be necessary to devote several days to getting the bowels properly emptied. A dose of calomel may be given first and then a saline mixture given daily or castor oil on one occasion, the action of the drugs being assisted by a daily enema. In some cases it is necessary to give large enemata to irrigate the whole of the colon. If the patient is kept in bed for a couple of days or more before the operation, it is worth while to get her to practise passing a motion and passing water in a recumbent position.

The evening before the operation she should have a light dinner, consisting of soup, fish, and a simple pudding or jelly. Nothing should

PREPARATION FOR ABDOMINAL OPERATIONS

The preparation should be begun, if possible, as long as thirty-six hours before the operation. The pubic hair should be shaved, and the patient should take a warm bath on the last night but one before the operation. After this the skin of the abdomen should be thoroughly scrubbed by the nurse with gauze and soap and water, special attention being paid to the umbilicus and any folds of skin in a fat patient. In the case of a really dirty patient, it may be necessary to use ethereal soap solution or turpentine, short of causing soreness of the skin. On the evening before the operation, the skin of the abdomen is painted with a 2 per cent. solution of iodine in rectified spirit. The abdomen is then covered with sterilized gauze or wool, and a many-tailed bandage applied. This painting is repeated when the patient is under the anæsthetic. If the preparation can only be begun the night before the operation, the patient should have a dry shave if possible. If the nurse cannot manage this, and soap has to be used in the shaving, the skin should be painted with acetone afterwards, and a few hours later painted with the iodine solution. The reason why a dry shave is advocated is that the iodine solution is much less efficacious if it is applied to skin which has been wetted during the previous ten or twelve hours.

The bladder should be emptied with a catheter just before the operation. Some operators consider that, unless there is some special indication present, it is best to dispense with the use of a catheter, as the patient may be more likely to suffer from retention of urine after the operation if a catheter has been passed before. In the writer's opinion this risk is so small as to be negligible. Whether a catheter is passed as a routine measure or not, it *must* be used in cases where there has been retention of urine or difficulty of micturition, as, for example, in the case of fibroids, especially those situated in the cervix or low down in the body of the uterus. If a catheter is not passed in these cases, there must be a risk of the bladder being wounded when the abdominal incision is made, and, apart from this, the operator will be hampered by the presence of even a small quantity of urine in the bladder. In the writer's opinion, a catheter should be passed just before the administration of the anæsthetic when any operation is to be performed involving the lower abdomen. The nurse may be satisfied that the patient has emptied her bladder naturally, but it may be found that there is half a pint or more in the bladder when the abdomen is opened. It is possible that the patient's nervousness leads her to secrete urine rapidly just before the operation.

be given for four hours before the operation, otherwise there will be a risk of vomiting during the administration of the anæsthetic. If the operation is to be performed at 9 a.m., the patient may be given a cup of tea or beef-tea at half-past four or five a.m. Some anæsthetists object to anything being given by the mouth, even at this interval before the operation, but experienced nurses are of opinion that the patient suffers more distress if she has not been allowed some form of nourishment during the early morning. If she is very thirsty, and complains of the dryness of her mouth before or after the injection of atropine, she may be allowed to wash out her mouth with water or soda-water, but urged not to swallow any. If patients are warned that swallowing fluids a few hours before the operation entails vomiting afterwards, they usually submit. If the patient is nervous, and does not seem inclined to go to sleep on the night before the operation, an hypnotic drug—such as bromidia or trional —should be given. Most anæsthetists like a hypodermic injection of gr. $\frac{1}{100}$ of atropine to be given not more than an hour and not less than half an hour before the operation, and some of them like $\frac{1}{4}$ gr. of morphine to be added. Before the operation the legs should be wrapped in cotton-wool, and bandaged from the toes to the thighs. In cold weather a cotton-wool or Gamgee jacket should be worn. If the patient's chest is wrapped up very warmly during the operation in hot weather, there is some risk of chill after the operation, unless this is carefully guarded against, resulting in the so-called ether-bronchitis or pneumonia.

If the patient is nervous the anæsthetic should be administered in a room adjoining the room or theatre in which the operation is to be performed, and not in the theatre itself. If this is impossible, the couch should be screened, as the sight of the operator and his assistants in modern operating garb, the instrument-tables, &c., even when covered with towels, may be startling and distressing to a nervous patient.

A gynæcological operation should not be performed during a menstrual period, unless postponement is considered to be dangerous. Probably all operators would agree with this statement in the case of vaginal operations, but there is a difference of opinion as to the necessity for postponing an abdominal operation if a menstrual period occurs just before the date chosen for the operation.

In a case where it is likely that vaginal drainage will have to be adopted, e.g. cases of thin-walled suppurating ovarian cysts, large pyosalpinx, &c., and before an operation which involves opening both the abdominal cavity and the vagina, such as panhysterectomy, the vagina should be prepared in the manner described under the heading 'Preparation for Vaginal Operations'.

on the morning of the operation. The vulva must be shaved the night before. Most nurses find that a 'safety' razor is much easier and safer to use than an ordinary razor. After the shave, the vulva, perineum, anus, and the surrounding skin are thoroughly washed with gauze and soap and water or lysol solution, special attention being paid to any folds. After this preliminary cleansing, the parts should be thoroughly swabbed with a solution of perchloride of mercury, 1 in 2,000, and then covered with sterile gauze kept in position by a T-bandage After defæcation or micturition, the swabbing is repeated. If a catheter is not passed before the administration of the anæsthetic in these cases, it can be passed when the patient is anæsthetized, as part of the final preparation. When the patient has been anæsthetized the vaginal walls are scrubbed gently but thoroughly with pads of sterile gauze or wool soaked in soap solution, then washed with plain water, followed by a solution of 1 in 1,000 biniodide of mercury in spirit, and lastly with a weak watery solution of biniodide or perchloride of mercury, or douched with saline solution or some other non-irritating solution. In a parous woman the pads of gauze or wool can be held in gloved fingers, in a nullipara they should be held in sponge-holder forceps, otherwise the upper part of the vagina cannot be swabbed thoroughly without an unnecessary amount of laceration of the vulval orifice.

PREPARATIONS FOR SPECIAL OPERATIONS

1. **Vesico-vaginal Fistula.** If there is cystitis the operation must be postponed until this is cured. If there is much soreness and excoriation due to constant soaking of the skin and mucous membrane with urine, the patient must be kept in bed for a few days, and the condition treated by suitable applications, such as bathing with lead lotion, dusting with starch and boric powder, &c. The bladder must be washed out with saline solution before the operation. This is usually done under the anæsthetic.

2. **Repair of a Ruptured Perineum.** If the bowels are not thoroughly emptied before this operation there is likely to be a leakage of fæces during the operation, which is exceedingly unpleasant even though it does not necessarily interfere with healing. The passage of hard scybalous masses the first time the bowels are opened after the operation will endanger the rectal sutures and may cause the formation of a recto-vaginal fistula. The presence of hard scybala is a proof that the bowels were not emptied thoroughly before the operation. No aperient should be given within the 36 hours before the operation, or there may be some leakage during the operation. The bowels should be well opened for several

PREPARATION IN EMERGENCY CASES

There is usually time for an enema to be given, and this should always be done if possible. In cases of extra-uterine pregnancy, suppurating ovarian cysts, &c., the iodine method of preparation of the skin is especially useful, as it does not entail any scrubbing of the skin of the abdomen. If the skin is scrubbed with soap solution, water, ether, solution of biniodide of mercury in spirit, &c., much more time is taken up, and there must be a risk of starting fresh intra-abdominal hæmorrhage, and even of rupture of thin-walled sacs. Union by first intention is nearly always secured by a thorough painting with iodine solution, even when no sort of preliminary preparation of the skin of the abdomen has been made.

PREPARATION OF FEEBLE PATIENTS

If the patient is feeble and anæmic, rest in bed for a week or two before the operation is to be advised, especially if she is poor and insufficiently fed. In hospital practice some patients—most often those suffering from uterine fibroids or from carcinoma—arrive in such a debilitated condition that immediate operation is contra-indicated. Such patients should be kept in bed for a fortnight or three weeks, with careful feeding, regular sleep, and the administration of a bitter mixture containing strychnine, and of some preparation of iron. The improvement in a debilitated hospital patient after a week or two of this 'building-up' treatment is often astonishing.

OPERATIONS PERFORMED DURING PREGNANCY

In these cases violent purgation is to be avoided. If the patient is constipated, four ounces of olive oil should be administered per rectum a few hours after the castor oil has been given by mouth, followed by an enema of soap and water. If vaginal douches are given as a routine measure before abdominal operations, they should be omitted in the case of a pregnant woman. A quarter of a grain of morphine should be injected half an hour before the operation. If these precautions are taken, abortion or premature labour is unlikely to occur as the result of an operation.

PREPARATION FOR VAGINAL OPERATIONS

The complete preparation of the vagina cannot be carried out until the patient is under the anæsthetic. A douche containing 20 minims of lysol to a pint of water should be given the night before, and repeated

SECTION II

THE AFTER-TREATMENT, RISKS, AND SEQUELÆ OF ABDOMINAL GYNÆCOLOGICAL OPERATIONS

BY

SIR JOHN BLAND-SUTTON, F.R.C.S. (Eng.)

Surgeon to the Middlesex Hospital.

days before the operation, an aperient should be given on the last night but one, an enema the night before, and a rectal wash of saline solution on the morning of the operation. If the preparation cannot be begun until the day before the operation several enemata should be given.

3. Operations for prolapse of the uterus or vaginal walls. In cases of prolapse in which the mucous membrane of the protruding cervix or vaginal walls has become scaly and thickened or ulcerated the patient should be kept in bed for several days, the procident parts being reduced and kept in place, if necessary, by tampons. Ulceration can be cured by douches of lead lotion if slight, by application of silver nitrate followed by douches if severe. If an operation is performed while the mucous membrane is thickened, œdematous, or ulcerated, healing by first intention is unlikely to occur.

4. Cases in which a tent has been inserted. The aperient should be given before and not after the insertion of the tent, as there is a possibility of the tent being expelled when the bowels act. In these cases an enema should be given on the morning of the operation, as it does not matter much if the tent comes out just before the operation. A morphia suppository should be inserted into the rectum directly after the introduction of the tent, otherwise the patient, especially if nulliparous, may be unable to sleep on account of pain.

CHAPTER I

THE AFTER-TREATMENT OF ABDOMINAL OPERATIONS

THE performance of ovariotomy, hysterectomy, and allied procedures is attended by several risks, immediate and remote, which may spoil the best-planned and most carefully executed operation. Some of these may be avoided by careful attention to the details embraced by the phrase ' after-treatment '.

The patient is returned to the bed with gentleness and usually lies on her back, but many anæsthetists prefer to turn the patient on one or other side for an hour, until there is a fair return to consciousness. The patient then lies on her back and a pillow is placed under the knees. Hot-water bottles should not be placed in the bed with the patient until she is completely conscious, and they are rarely needed. The healing of blisters caused by hot-water bottles is a slow process. During the first twelve hours the patient complains of pain, thirst, and vomiting.

The thirst is in a measure relieved by administering six or eight ounces of normal saline solution by the rectum an hour after the patient returns to bed, and repeating it in three or four hours. The patient may wash her mouth out frequently with water, hot or cold, according to her fancy, and if there is no vomiting she may swallow a little hot water from time to time. As a rule, it is better for her to abstain from swallowing anything for the first eighteen hours; the best way to avoid vomiting after an anæsthetic is to keep the stomach empty.

There is always some pain after an abdominal operation, partly due to tension on the sutures, and colic. The injection of normal saline solution (a teaspoonful of salt to a pint of water) by the rectum often controls this, but occasionally the pain is so severe that it is necessary to give a quarter of a grain of morphine hypodermically, or in a suppository, about twelve hours after the operation, in order to procure sleep. The routine use of morphine after these operations is injudicious and rarely necessary.

At the end of twenty-four hours small quantities of barley-water, tea, or milk and water are given, and if retained they may be taken in increasing quantities. On the fourth day an enema is given to clear the bowel and then the patient will take fish, chicken, &c., and soon get on to convalescent diet.

CHAPTER II

COMPLICATIONS OF ABDOMINAL GYNÆCOLOGICAL OPERATIONS

Metrostaxis. After ovariotomy and oöphorectomy, unilateral or bilateral, blood sometimes escapes from the uterus in the course of the first week, and simulates menstruation: it sometimes occurs within forty-eight hours of the operation, and is usually ushered in with a rise of temperature (100°–101°).

Bed-sores. These sometimes give trouble when operations are performed on elderly or enfeebled patients, especially when they are thin and have incontinence of urine. With due watchfulness and care on the part of the nurse, a bed-sore ought rarely to occur.

Post-anæsthetic paralysis. Paralysis following operations on the pelvic organs occurs in connexion with the upper and lower limbs; it is an awkward and avoidable complication. Some of the simplest cases are those which arise from the pressure upon an individual nerve, such as the ulnar, circumflex, or radial, due to the arm coming in contact with the sharp edge of a metal operating table. When the patient's legs are flexed across the sharp edge of the table and fixed, as in the Trendelenburg position, during a long operation, the common peroneal nerve is liable to be compressed and the muscles supplied by it paralysed. In some instances the paralysis is bilateral. Paralyses of this kind are identical with what are known as 'sleeping palsies'. The more serious paralyses are directly due to the Trendelenburg position, in which there is a great tendency for the arms to be displaced over the head and hang downwards, or abducted, as this position causes the clavicle to compress the nerves of the brachial plexus upon the first rib, or the scalenus anterior muscle, and perhaps, as some observers believe, between the clavicle and the transverse processes of the fifth and sixth cervical vertebræ.

Most of the writers on this subject attribute the paralysis more particularly to drawing the head to one side when the patient lies in the Trendelenburg position with the abducted upper limbs, as it tends to stretch the lower cervical nerves of the opposite side, especially the fifth. This stretching is probably a greater factor in producing paralysis than pressure.

When vomiting is very troublesome, it is sometimes necessary to keep a patient on rectal feeding two or three days.

When there is abdominal distension, this may be relieved by the passage of a rectal tube at intervals of three hours, and if this fails a turpentine enema should be given.

Patients should always be encouraged to empty their bladder naturally: many are unable to pass water whilst lying on their backs. In these cases the urine is drawn from the bladder by a carefully sterilized glass catheter. Before passing the catheter, the nurse carefully wipes away the mucus from the urethral orifice. Cleanliness and care with the catheter must be enforced: cystitis causes much misery. During the first few days the quantity of urine passed by the patient is measured, and recorded in the note-book.

The temperature should be observed every four hours during the first week and recorded. The first record after the operation is usually subnormal, and in twelve hours it rises to normal and beyond. During the first twenty hours it may rise to 100° without causing alarm; beyond this, if accompanied by a rapid pulse, an anxious face, and distended belly, it will cause anxiety to the surgeon. A temperature of 101° or 102° unaccompanied by other unfavourable symptoms is not a cause for alarm, unless maintained.

The state of the pulse is a valuable guide and more trustworthy than the temperature. When the pulse remains steady and full there is no cause for alarm. When it increases in frequency to 120 or 130 beats per minute, and is thin and thready, then there is danger, even if the temperature is only slightly raised.

On the seventh or eighth day the sutures will require removal. Occasionally a hæmatoma forms in the wound; and in patients in whom the operation has been performed for septic conditions, stitch abscesses will occur. In septic cases the sutures require to remain a few days longer, to allow the wound to unite more securely.

When oöphorectomy, ovariotomy, or hysterectomy is followed by a non-febrile convalescence the patient may be allowed to leave her bed on the fourteenth day, and at the end of another week she may return to her home or go to the seaside according to circumstances. When the wound has healed by primary union, and this is usual where aseptic methods have been followed and buried sutures employed for the fascial and muscular layers, an abdominal belt is unnecessary. When suppuration has taken place in the wound and healing has been retarded, especially in a patient in whom operations have been performed for septic conditions, it is a useful precaution to advise her to wear a well-made belt. This is more necessary for women who have to get their living by hard work.

CHAPTER II

COMPLICATIONS OF ABDOMINAL GYNÆCOLOGICAL OPERATIONS

Metrostaxis. After ovariotomy and oöphorectomy, unilateral or bilateral, blood sometimes escapes from the uterus in the course of the first week, and simulates menstruation: it sometimes occurs within forty-eight hours of the operation, and is usually ushered in with a rise of temperature (100°–101°).

Bed-sores. These sometimes give trouble when operations are performed on elderly or enfeebled patients, especially when they are thin and have incontinence of urine. With due watchfulness and care on the part of the nurse, a bed-sore ought rarely to occur.

Post-anæsthetic paralysis. Paralysis following operations on the pelvic organs occurs in connexion with the upper and lower limbs; it is an awkward and avoidable complication. Some of the simplest cases are those which arise from the pressure upon an individual nerve, such as the ulnar, circumflex, or radial, due to the arm coming in contact with the sharp edge of a metal operating table. When the patient's legs are flexed across the sharp edge of the table and fixed, as in the Trendelenburg position, during a long operation, the common peroneal nerve is liable to be compressed and the muscles supplied by it paralysed. In some instances the paralysis is bilateral. Paralyses of this kind are identical with what are known as 'sleeping palsies'. The more serious paralyses are directly due to the Trendelenburg position, in which there is a great tendency for the arms to be displaced over the head and hang downwards, or abducted, as this position causes the clavicle to compress the nerves of the brachial plexus upon the first rib, or the scalenus anterior muscle, and perhaps, as some observers believe, between the clavicle and the transverse processes of the fifth and sixth cervical vertebræ.

Most of the writers on this subject attribute the paralysis more particularly to drawing the head to one side when the patient lies in the Trendelenburg position with the abducted upper limbs, as it tends to stretch the lower cervical nerves of the opposite side, especially the fifth. This stretching is probably a greater factor in producing paralysis than pressure.

The form of paralysis produced in this way is that known as Erb's palsy, and the muscles particularly concerned are the deltoid, brachialis anterior, biceps, and the brachio-radialis. Sometimes the spinati are involved. Occasionally the paralysis is bilateral. A case has been reported in which there was a total lesion of the brachial plexus, including the muscles of the shoulder girdle.

The following case serves to show that stretching rather than pressure is responsible for this class of paralyses. A patient had undergone a vaginal operation in the crutch position, when the assistant drew her along the table by means of his fingers hooked in the axillæ over the folds of the pectoral muscles: next morning both upper limbs were found to be paralysed, and they remained in this condition many weeks.

In some of the lighter forms the paralysis passes off in a few days, but cases are known in which it has persisted for many months, and as it renders the limb useless for a time it is a serious matter.

Halstead refers to a case of bilateral peroneal paralysis following salpingectomy in the Trendelenburg posture which disabled a patient for six months.

On the whole, prognosis is favourable, and recovery the rule.

Büdinger has described a case in which the upper limb was paralysed after an abdominal operation. The patient died some weeks later, and a clot of blood was found pressing on the surface of the brain at a spot corresponding to the arm centre.

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Giving way of the wound. After cœliotomy the patient runs a risk of the wound being burst open, and this accident seems particularly liable to happen in cases where catgut has been selected for the suture material. Accidents of this kind belong to two categories :—

1. Many cases occur in patients from violent coughing or vomiting, as the straining causes the knots of the sutures to slip.

2. In feeble patients, and those debilitated by anæmia, diabetes, &c., and especially in septic wounds, the union of the edges of the incision

occurs very slowly; if the sutures are taken out on the eighth day, as is the custom, the wound is liable to burst asunder. This accident is prone to occur in patients whose abdominal wall has been greatly distended by a large tumour, and especially by pregnancy. On the whole, the accident is more liable to complicate Cæsarean section than any other operation on the pelvic organs, and cases have been reported in which there has been a repetition of the accident. The largest collection of case-reports in which the wound has burst open after cœliotomy has been made by Madelung; a perusal of his paper shows that it is an accident with a high mortality. It is a fact that cases of this kind are rarely published, and from inquiries I find that it is of common occurrence. It has certainly diminished since surgeons have widely adopted the method of securing the wound with buried suture, but this is not always a preventive. The complication which makes the accident so unfortunate for the patient is the protrusion of the intestines (see p. 20).

In dealing with this condition the surgeon carefully and gently cleans the extruded intestines and omentum with sterilized water, returns them into the abdomen, and re-sutures the wound.

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Hæmorrhage. However carefully an operation may be conducted, or whatever material may be employed for ligatures, there is a liability of bleeding after the patient has been returned to bed. Severe internal bleeding is usually due to the slipping of a ligature from an ovarian pedicle, or a uterine artery: it may come from a vaginal artery, especially in total hysterectomy, and occasionally from a vessel in an adhesion which has been missed in the course of the operation, for oozing which is scarcely appreciable when a patient is collapsed may become very free when reaction occurs

Severe internal bleeding is manifested by very obvious signs: pallor, cold skin, rapid but feeble pulse, restlessness, and sighing respiration. When these symptoms are manifested the wound must be reopened, the blood and clot removed, and the bleeding-point secured. It often happens, where the bleeding is due to the slipping of a ligature from the uterine or ovarian artery, that by the time the surgeon reopens the wound the patient is so bloodless that there is difficulty in determining the source of the bleeding. In very bad cases it is a wise plan to

arrange for an assistant to perform the intravenous infusion whilst the surgeon deals with the bleeding vessel.

Intravenous injection is the best method of treating patients when the loss of blood has been great. It is unwise to transfuse more than three pints into the veins, or the lungs will become waterlogged and the patient will be later in great peril. When the loss is moderate in amount and the patient is not greatly enfeebled, a pint or more of saline solution may be poured into the abdomen before closing the incision, and this may be supplemented by the administration of six or more ounces of the solution by the anus at two-hourly intervals until the force of the circulation is restored.

In some instances the subcutaneous injection of normal saline solution may be employed. A suitable region is the loose tissue under and around the breasts. When this method is adopted the skin should be rendered antiseptic, otherwise troublesome abscesses and cellulitis will arise in the subcutaneous tissue at the situation where the saline solution has been injected.

Intrapelvic hæmorrhage. For many years I have maintained that two factors which have enabled hysterectomy to vanquish oöphorectomy in the treatment of uterine fibroids are *rigid asepsis* and *perfect hæmostasis*. In the early days of intrapelvic surgery there used to be much discussion on the subject of free blood in the pelvic cavity: some practical surgeons urged that it was harmful and would induce peritonitis, and others took the opposite view. From my own observations I came to the conclusion that effusions of blood in the abdomen were often quickly absorbed, but that this was not invariable; and that post-operative collections of blood were very liable to become septic, especially when drainage was employed. I also pointed out that the large effusions of blood in the abdomen due to tubal abortion, or to the rupture of a gravid tube, are often attended with fever, and in some instances the temperature rises to 103°. In such cases, when operative interference is undertaken, the deliquescent clot present in the pelvis often gives off a musty odour. Much light has been thrown on this condition by Dudgeon and Sargent, who have specially investigated the bacteriology of intraperitoneal effusions. These observers have isolated from intraperitoneal effusions of blood a white staphylococcus, which makes its appearance in the blood within a few hours of being effused, and they are of opinion that the febrile disturbances so frequently found after effusions of blood into the peritoneal cavity are due to the presence of this organism.

Apart from the pathological importance of these observations, there is a point of practical value connected with them. The white staphylococcus will infect sutures and give rise to stitch-abscesses in the wound;

in view of this fact it behoves the surgeon who has to deal with a stale effusion of blood in the pelvis and evacuates it by an incision through the abdominal wall, that in closing the incision he should employ through-and-through sutures, and not attempt to suture it layer by layer.

Pneumonia. This is a serious and not infrequent sequel of cœliotomy, especially when it concerns diseased conditions in the upper half of the abdomen: pneumonia occurs frequently as a sequel to ovariotomy, hysterectomy, and allied operations, and occasionally has a fatal ending. It may arise from inhalation, or may be due to the dorsal position (hypostatic pneumonia), or it may arise from infection.

Inhalation pneumonia is not uncommon, and although it is often attributed to the anæsthetic, especially ether, it is doubtless due to a combination of causes, such as a cold room, undue exposure of the body, septic teeth, the chilling effects of ether on the tissues of the lung, and occasionally to a dirty face-piece belonging to the ether or chloroform apparatus.

Hypostatic congestion of the lungs is liable to occur in the aged and in debilitated patients; it is a complication in such cases always to be guarded against.

Embolic pneumonia is the most serious form, and occurs as a sequel to operations for septic conditions, such as uterine cancer, suppurating ovarian cysts, septic fibroids, and post-operative sepsis; it is also associated with thrombosis, especially when the pelvic veins contain septic clot.

In the preceding section attention was drawn to the appearance in intra-abdominal blood effusions of a white staphylococcus: such collections of blood are prone to decompose and cause the temperature to rise.

On several occasions in which blood has been effused freely into the pelvic cavity, either as a consequence of tubal pregnancy, or as a sequel to an operation, such as an abdominal myomectomy, and the blood has been allowed to remain, or it has been inefficiently drained, the patients have died from septic pneumonia.

In cases of septic thrombosis the patients run a definite risk from pulmonary embolism. When the embolus is large the patient sometimes dies in a few minutes (see p. 22); but even in cases where the embolus is too small to promptly destroy the patient's life, its lodgement in the lungs entails in some instances a very serious illness, and occasionally a fatal termination.

Parotitis. Septic parotitis, or, as it is sometimes called, symptomatic or secondary parotitis, to distinguish it from mumps, is an occasional sequel to abdominal operations of all kinds. Careful observations have

shown that parotitis is more common after operations for septic conditions, and, although it occasionally occurs after operations which run an afebrile course, the conditions underlying it are mainly septic in character.

Septic parotitis is distinguished from mumps in the following points:—

It occurs as a complication of some other affection, is in itself non-contagious, and occasionally suppurates. There are two views held in regard to its ætiology: some hold that it is due to direct infection of the duct (Stenson's) of the parotid gland by micro-organisms from the mouth, whilst others maintain that the path of infection is mainly by the blood-stream.

Two able investigations have recently been published in regard to this condition, in which one writer (Bucknall) supports the view that it is an ascending affection from the mouth, and the other (Tebbs) brings forward evidence that the elements of infection reach it by the blood-stream.

Lequeu has seen many cases of post-operative parotitis, and at his suggestion Verliac and Morel investigated the condition in the laboratory. They came to the conclusion that this variety of parotitis originates in the duct of the gland.

When parotitis complicates post-operative convalescence, it is almost entirely confined to septic cases: it may occur within two days of the operation or as late as the thirtieth day. It is more common between the sixth and tenth days, and its advent is accompanied by much disturbance. The parotid swells and becomes painful and tender; the skin over it is red and often brawny. These signs are accompanied by fever, malaise, and depression of spirits. In mild cases they subside in a few days, but in severe cases rigors occur, with high fever and suppuration.

The mild cases are best treated with warm fomentations, frequently changed. If suppuration occurs, the pus will need to be evacuated by a scalpel, but incisions in a suppurating parotid gland should be carried out with careful regard to the branches of the facial nerve (pes anserinus), and the large vessels intimately associated with it.

The surgeon need not be in a great hurry to use the scalpel in these cases, for it seems occasionally as if the skin would slough, and yet when it is incised no pus escapes. This septic parotitis is deceptive in the red and brawny appearance of the skin covering the swollen gland, and the misleading sense of fluctuation. In many instances the inflammatory products escape by way of the parotid duct.

Septic parotitis is an unpleasant and painful complication of an abdominal operation, but it is rarely dangerous and has only had a fatal termination in very exceptional cases.

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Post-operative thrombosis. A perusal of surgical and gynæcological periodical literature of all countries contains frequent references to thrombosis of the saphena, femoral, and iliac veins as a sequel to pelvic operations. It is usually noticed about the twelfth day, and its occurrence is intimated by fever, pain in the thigh and leg, quickened pulse, and gradually increasing œdema of the leg. When the signs and history of cases of post-operative thrombosis are carefully considered they can be arranged in two groups · in one the saphena vein is involved, in another the femoral and iliac veins.

The simplest conditions are those in which thrombosis is limited to the saphenous vein. The patient complains of pain in the groin and along the front of the thigh; often pain and tenderness are confined to the calf. The tenderness is mainly in the skin overlying the thrombosed vein. When the thrombosis is confined to the saphenous vein, the acute symptoms subside in ten or fourteen days. As a rule, it affects one limb, but when both become involved, the occurrence is usually consecutive.

In many instances the thrombosis attacks the femoral and external iliac veins, and I have come to the conclusion that thrombosis of these veins occurring as a sequel of abdominal hysterectomy is often due to infection of the abdominal incision, and the channels of infection are the inferior epigastric veins, superficial and deep, and the collateral lymph-vessels (Fig. 1).

Femoral thrombosis and fatal pulmonary embolism are recognized sequels of hysteropexy. In this operation if the retaining sutures are passed too deeply into the uterine wall they traverse the endometrium, and if it be septic the silk thread will be infected and cause trouble. A study of the facts led me to believe that the factors which produce the changes in the abdominal wound ending in thrombosis of the femoral, external iliac, or femoral veins are buried sutures. I made a series of trials in which a number of median abdominal incisions were closed with buried silk sutures, also a series of cases in which through-and-through sutures were employed. However carefully the silk is prepared and the sutures inserted with hands covered with sterilized rubber gloves, now and then a buried suture will give trouble. Even when the sutures appear

to settle down without disturbance they often cause trifling rises of temperature.

Surgeons who habitually employ catgut for buried sutures admit that the absorption of the catgut is accompanied by fever, but there is a serious objection to this use of catgut. During the period of its absorption the union

them to separate and permit protrusion of the intestine. (See p. 17.)

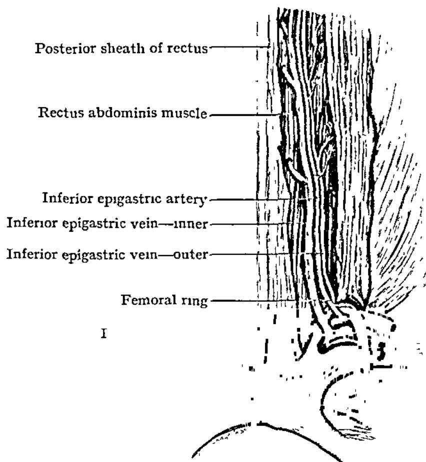


Fig 1. Posterior View of the Rectus Abdominis Muscle below the level of the Umbilicus. The origin of the inferior epigastric artery and the termination of the vein is shown.

The excessive frequency with which thrombosis occurs as a sequel of abdominal hysterectomy performed for cancer as compared with fibroids is another fact worth bearing in mind, for, as has been pointed out, cancer in the neck of the uterus often teems with streptococci, and these are notorious agents in causing thrombosis When these things are carefully considered and then compared with the comparative infrequency of thrombosis after vaginal operations, the evidence is strong that the

excessive frequency of pulmonary embolism after abdominal hysterectomy is in a measure due to buried sutures becoming infected from the contaminated fingers of the surgeon.

The trifling modification in technique described on p. 108, consisting in applying tincture of iodine to the remnant of the cervical canal left in the stump, and to the cut surface of the stump, and thoroughly disinfecting the gloved hands in perchloride of mercury (1 in 5000), before tying the uterine arteries and introducing the mattress sutures, has been followed by good consequences. The careful disinfection of the gloved hand should be repeated before suturing the wound.

The occlusion of the femoral and iliac veins by clot leads to solid œdema of the thigh, which gradually extends to the leg. This complication is often a serious matter for the patient, as it entails a long confinement to bed, a tedious convalescence, and the œdema will persist for many months, and occasionally impairs the circulation in the limb for several years, in spite of topical applications, careful bandaging, and judicious massage.

The œdema of the leg is usually attributed to obstruction of the femoral and iliac veins by clot, but the condition is not so simple, there is in addition lymphangitis. This associated plugging of the lymph vessels has probably a greater effect in producing the swelling of the leg than the obstruction caused by the intravenous clot. It is a frequent matter of comment, that the accident which so often has a tragic ending—the lodgement of an embolism in the pulmonary artery—occurs in patients when there has been no evidence of thrombosis, yet after death when the iliac veins are examined large thrombi are found therein.

During the time I was occupied in studying the effects of buried sutures in producing thrombosis, I buried no sutures in an abdominal incision for two years, except in one instance During that period I had no post-operative thrombosis, and only one case of pulmonary embolism, and that happened to the patient in whom I used buried sutures. She was a midwife on whom I performed hysterectomy for a big submucous fibroid; and as she was a stout woman and led an active life, extra care was taken to secure a sound abdominal scar. She was making apparently an uneventful recovery until the eighth day; then her temperature rose without any warning to 103° Fahr. On examination, some hardness could be felt in the lower portion of the wound. There was no œdema and no tenderness in the groin, and no evidence of pulmonary complications. I warned my house surgeon that in all probability she had thrombosis of the deep veins, and there was impending danger of a pulmonary embolism. She died suddenly a few hours later, and an embolus was found at the post-mortem examination firmly plugging the pulmonary artery.

EMBOLISM OF THE PULMONARY ARTERY AFTER HYSTERECTOMY

Although pulmonary embolism is common after abdominal hysterectomy, it is difficult to obtain reliable statistics because surgeons are reluctant to publish their experiences of this tragic sequel to an operation. There is sufficient evidence available to give some notion of the relative frequency of pulmonary embolism after hysterectomy for fibroids, and the following facts not only help in this direction, but show an extraordinary variation in the practice of different surgeons. For example: Baldy found that among 366 operations for fibroids in the Women's Hospital, Philadelphia, there were thirteen sudden deaths attributed to embolism. In the Middlesex Hospital in the years 1896–1906, both years inclusive, there were 212 abdominal hysterectomies for fibroids; three patients died from pulmonary embolism. At the New Hospital for Women, London, during 1901–1910, hysterectomy was performed for fibroids 189 times; two patients died from pulmonary embolism (Lepper). In the practice of individual surgeons the results differ widely Lyle, among eight subtotal hysterectomies for fibroids lost one patient from pulmonary embolism ; Spencer lost two patients from this cause out of 85 total hysterectomies, and Olshausen five out of 366. Among 1,500 abdominal operations for fibroids I have lost three patients from pulmonary embolism, and in one of these women the fibroid was complicated with cancer of the corporeal endometrium.

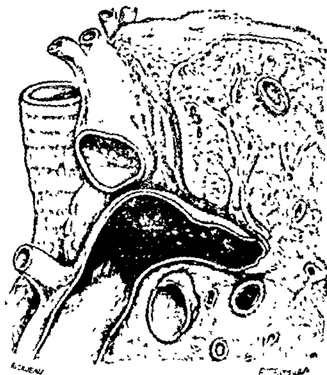


FIG. 2. THE PULMONARY ARTERY AND ADJACENT PART OF THE LUNG AND TRACHEA. The artery is completely occluded by a clot derived from a thrombus in the right auricle. (*Museum of the Middlesex Hospital.*) Three-quarter size

A broad study of the statistics indicates that in the practice of some surgeons, fatal pulmonary embolism occurs in at least 1 per cent. of the patients who have abdominal hysterectomy performed for fibroids.

This tragic mode of death is more frequent after total than after subtotal hysterectomy; it is a recognized sequel of hysteropexy, and the risks of its occurrence after abdominal hysterectomy for cancer is higher than for other pelvic operations.

In considering embolism of the pulmonary artery in relation to hysterectomy, it is necessary to point out that the pelvis contains two potential reservoirs of clot—the iliac and the ovarian veins; as a rule, the iliac veins are the common source of the fatal clot.

Before describing the mechanical occlusion of the pulmonary artery by an embolus, there are a few points worth consideration. This vessel has the structure of an artery, but conveys venous blood to the lungs; it has a greater diameter than any other artery, for the cross measurement above the sinuses of Valsalva is given by anatomists as 28 mm., so that a large clot is required to plug it effectually. An embolus large enough for this purpose comes, as a rule, from the inferior vena cava, or from a thrombus in the right auricular cavity, or from the iliac veins.

Often the pulmonary artery is found, at a post-mortem examination, completely blocked by an embolus, yet a careful examination of the venous system fails to reveal the source of the migratory clot. In these instances probably the whole of a clot formed in a vein of moderate size slips from its surroundings, and although an elongated thrombus may be too narrow to block the pulmonary artery, it may be doubled up by the blood-stream and form an effective plug. An embolus too small to occlude the pulmonary artery sometimes lodges on the ridge separating the right from the left branch; such a clot may act as an autochthonous thrombus and induce the propagation of additional clot which will fatally occlude the main trunk of the artery.

Pulmonary embolism may occur as a sequel of hysterectomy at any time from the hour of the operation onward to the thirtieth day. The majority of cases happen about the twelfth day; the detachment and transit of the clot is usually preceded by movement such as getting out of bed, sitting up in bed, but more particularly straining at stool. In one remarkable case, a woman complained of sciatic pain seventeen days after vaginal hysterectomy. To relieve this the surgeon flexed the patient's thigh on her abdomen and suddenly extended it. This dislodged a clot and the woman was seized with signs of pulmonary embolism and died in forty-seven minutes. At the post-mortem examination the pulmonary artery was found to be occluded and the left ovarian vein thrombosed (Byrom Robinson).

The most constant symptoms of pulmonary embolism are sudden, urgent dyspnœa, great pain in the chest, accompanied by agony and fear of death. 'Particularly striking is the contrast between the violence

of the dyspnœa and the freedom with which the air enters the lungs, and in the absence of pulmonary physical signs' (Welch). As a rule, the face is blue and covered with cold sweat. Death may follow in a few minutes or it may be delayed several hours. The patient remains conscious, but suffers severe mental distress. On one occasion I saw a woman within ten minutes of the lodgement of an embolus in the pulmonary artery; she was livid and unconscious, and although she had ceased to breathe, her heart continued to beat regularly and forcibly for five minutes after my arrival, then stopped suddenly. A patient convalescent after hysterectomy, performed for fibroids, may be dressing to leave the hospital and fall dying across the bed, or on the floor of the ward, or in the courtyard of the hospital. Periodical surgical literature contains many instances of these dramatic forms of sudden death due to post-operative pulmonary embolism.

Occasionally a patient may rally after the most urgent symptoms; then, later, an extending thrombus or a fresh embolus will cause death. Recovery may occur even in very desperate cases. It is not uncommon for women recovering from hysterectomy to be seized with a sudden pain in the side of the chest severe enough to fill them with alarm: in a few hours the temperature rises perhaps to 102° or 103° Fahr., and there may be some blood-stained sputum ejected. The physical signs indicate a patch of pleurisy or pneumonia. Attacks of this kind are not fatal, but they occasionally delay convalescence: they are due to the arrest of small emboli in the pulmonary vessels. In some cases patients recovering from hysterectomy will exhibit signs which indicate that there has been a shower or a succession of small pulmonary emboli. The patients usually recover.

It has been suggested that the practice of keeping patients strictly confined to bed for two or three weeks after hysterectomy and allied operations is responsible for the thrombosis which is the source of these fatal emboli Some American surgeons act on this suggestion and insist on their patients getting out of bed a few days after such operations. This method does not commend itself to British surgeons. In my own practice I make it a rule, even in the most favourable conditions, to keep the patients confined to bed for two weeks. No patient is allowed up until her temperature has been normal for at least three days. The consequences of this practice appear to be justified, for in my last thousand hysterectomies, only one of the patients lost her life in consequence of pulmonary embolism.

In cases of embolism of the pulmonary artery, death does not always occur immediately, but may be postponed for an hour or more after the lodgement of the embolus.

Trendelenburg is of opinion that it might be possible to remove the clot by direct surgical intervention. After careful consideration of the matter he carried out this operation on a woman aged sixty-three years; he raised an osteoplastic flap on the left side of the thorax, exposed the conus arteriosus and intended to withdraw the clot by means of a specially constructed pump, through a slit in its walls. The patient died from excessive bleeding before the clot could be extracted; the operation was hindered by an adherent pericardium.

Trendelenburg has carried out this operation on a man forty-five years of age. This patient was tabetic and sustained a spontaneous fracture of the femur. One month later he was seized with urgent dyspnœa and signs clearly indicating the lodgement of an embolus in the pulmonary artery. Trendelenburg exposed the heart, opened the pulmonary artery and by means of polypus forceps succeeded in withdrawing 34 centimetres of clot. The incision in the artery was carefully closed with sutures. The man improved considerably as the result of the operation, but died thirty-seven hours later. At the post-mortem examination the left and right branches of the pulmonary artery contained an embolus. From the surgical point of view there are no reasons why such a bold example should not be repeated with success.

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Foreign bodies left in the abdomen. Every writer on ovariotomy and kindred operations insists on the importance of exercising the utmost personal vigilance in counting instruments and dabs before and immediately after an abdominal operation in order to avert the dangers

which ensue when instruments, dabs, gauze, or drainage tubes are accidentally left in the abdominal cavity. Before the era of antiseptic surgery nearly all the patients in whom foreign bodies were left in the abdominal cavity died. In several instances the surgeon has discovered, on counting the sponges and instruments after the operation, one or more to be missing, and, failing to find them in the room, has reopened the wound and recovered the missing article. In many lucky cases a sponge or compress has given rise to an abscess, the wound has reopened and the sponge presented at the opening. Often a compress of cotton-wool or gauze has slowly ulcerated into the rectum and been discharged through the anus.

When things of this kind are left in the abdomen the risks are not so great now as in pre-antiseptic days, but they cause much discomfort and anxiety as well as suffering : moreover, such an accident entails reopening the wound and occasionally a serious operation for the removal of the missing article, and as a recent decision in a Court of Law fixes the responsibility on the operator, there is always the possibility of an action at law with all its vexations and the liability of being mulcted in damages.

The behaviour of foreign bodies left in the abdomen is curious and also interesting from the great length of time which metal instruments will sometimes remain without causing very urgent symptoms, and the tendency they exhibit to penetrate adjacent viscera.

Among the early cases Sir Spencer Wells reported one in which a pair of forceps was found in a patient's bladder who died a month after ovariotomy. Olshausen mentions that a pair of forceps was passed by the rectum nine months after ovariotomy, and Terrillon tells of a pair of pressure forceps which remained eight months in the belly and came out close to the navel. One of the most remarkable instances is recorded by MacLaren, in which a pair of forceps was left in the abdomen in the course of a hysterectomy. Two years later, a swelling formed in the right iliac region ; this was explored through an abdominal incision, and the hæmostatic forceps represented in Fig. 3 was found embedded in the omentum ; the forceps had ulcerated into the cæcum and the blades were lodged in the vermiform process. The patient recovered.

In order to illustrate the diminished risks run by patients when the instruments and dabs used in operations are thoroughly sterilized, reference may be made to a case reported by J E. F Stewart (Australia), in which he removed a pair of pressure forceps which had remained in the abdomen for ten years and a half. The patient, who had been more or less an invalid since the primary operation, had suffered from attacks of acute pain, constipation alternating with diarrhœa, and pains in the lower limbs. The instrument, which measured 5 inches long and 2½ across the handles, was lying point downwards in the pelvis, and the ring-handles

could be felt through the belly-wall before the operation : it had made its way into the small intestine.

The tendency for a foreign body, whether hard like forceps, or soft like gauze pads, to erode its way into the intestine is very remarkable. Thus Gifford operated on a patient with intestinal obstruction : an impacted mass was felt in the ileum, it was extracted through an incision in the gut and proved to be a pad of cotton-wool enveloped in gauze. She recovered. Three months previously this woman had undergone abdominal myomectomy.

Doléris had a remarkable experience in 1912. A woman had her left uterine appendages removed and subsequently became pregnant. When labour began delivery was obstructed by a mass in the pelvis

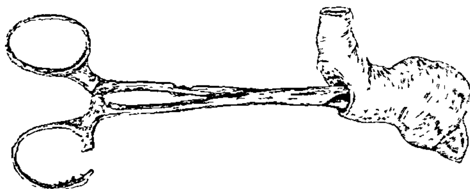


FIG 3. A PAIR OF PRESSURE FORCEPS. This instrument had remained in the abdomen two years after hysterectomy. The forceps had ulcerated into the cæcum and the blades had lodged in the vermiform process. (*After MacLaren.*)

which felt like a tense ovarian dermoid. Cæsarean section was performed; in the course of the operation a gauze pad, six inches in diameter, was found in the pelvis, bathed in pus. The uterus was removed and the pelvic cavity drained.

Another source of risk to patients is the practice or habit of packing the pelvic recesses with strips of gauze temporarily, either with the hope of controlling oozing, or to serve as a drain. I have long abandoned this habit. The disadvantage of gauze stuffing which needs consideration in this section is the risk that some portion, or the whole of it, is sometimes left in the wound. Examples are known where long strips of 'gauze stuffing', sometimes amounting to a yard or more, have been passed through the anus a year after the operation. Many intractable sinuses have had a forgotten piece of gauze as the cause of their persistence.

A woman had cœliotomy performed for peritonitis, the consequence

of criminal abortion; she had a long convalescence due to an intractable sinus. Eventually the patient was thought to have tuberculous disease of the appendages, and a mass, formed mainly by the uterine tube, was removed; the walls of the tube were intact, but when slit open it was found to contain a small gauze tampon (Kouwer).

The isolated records relating to foreign bodies left in the abdomen are very numerous. Thus Wilson, in 1884, was able to collect twenty-eight cases from periodical literature and personal reports from friends. An interesting discussion took place on the reading of a paper on this subject before an American gynæcological society, by R. W. Waldo, and the number of cases related by the members is astonishing and refer to such things as sponges, dabs, forceps, a strip of iodoform gauze 'a yard wide and two yards long', a pair of spectacles, and 'an operating-room towel', which were left in the abdominal cavity.

The most comprehensive collection of records relating to foreign bodies left in wounds of all kinds has been made by F. von Neugebauer; they amount to 195.

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Tetanus. This dread complication of wounds occasionally occurs after ovariotomy, and during the 'reign of the clamp' it was especially frequent in Germany (Olshausen). Cases have been reported in England, and tetanus has been noticed to affect patients who have been ovariotomized in rooms recently plastered.

Since Kitasato demonstrated the bacillary origin of tetanus poison, and showed that the bacillus can be transported by dust, knowing its liability to attack suppurating wounds, we can understand that when the pedicle of an ovarian cyst was secured by a clamp and allowed to slowly slough away, more or less exposed to air and dust, it offered a nidus for the tetanus bacillus.

Tetanus, however, has not quite disappeared as a sequel to operations on the pelvic organs, for in 1902 a case was reported by Dorsett in which a patient died of this disease after hysteropexy, and the tetanus bacillus

was detected in some wallaby tendon employed to suspend the uterus. Tetanus has also been traced to infected catgut employed in cholecystotomy (1905).

Ed. Martin reported the occurrence of tetanus after vaginal fixation of the uterus and colporrhaphia anterior. Cumol-catgut was employed.

Menzer has recorded a similar case which occurred in Dührssen's Klinik (1901). The ligatures were of catgut.

Mallet refers to two post-operative deaths from tetanus. One patient had undergone an operation for bilateral pyosalpinx and the other had a fibroid of the uterus complicated with an ovarian cyst. There was an interval of eighteen months between the two fatal cases. Catgut was employed as the ligature material.

In practice it is important to remember that tetanus arises from infection: hence all instruments which have been in contact with this disease must be sterilized, and this should be effected by submitting them to prolonged boiling.

Tetanus occurs as a rare sequel to miscarriage and normal labour. Kraus and von Rosthorn have reported some carefully investigated cases of this kind.

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Injury to intestines. The intestines, great and small, are very liable to injury in the performance of intrapelvic operations. Unless care is taken in opening the abdomen, the intestines are apt to be cut, especially when there has been chronic peritonitis, as in tuberculous and gonococcal infections, which cause the small intestine to adhere to the parietal peritoneum investing the anterior abdominal wall. Where cœliotomy is being performed a second or third time, through or near the original cicatrix, it is necessary to proceed with extreme caution for fear of cutting an adherent coil of gut.

Intestine is also liable to be torn in separating adhesions from the tumour, and great care is necessary when cysts are firmly adherent to the floor of the pelvis, for in separating them the rectum runs a great risk of being damaged.

In removing tumours to which the vermiform process adheres it is necessary to be careful and avoid mistaking it for an adhesion, for there is reason to believe that this structure has been divided and its nature overlooked ; an accident of this sort leads usually to fatal peritonitis.

It has happened, in the course of removing very adherent ovaries and tubes from the floor of the pelvis, that in transfixing the pedicle a coil of ileum has also been transfixed with the needle and tied to the stump. This accident is not likely to happen now that the Trendelenburg position is almost universally employed.

In sewing the abdominal incision the intestines have been pricked with a needle, and in some instances the bowel has been accidentally included in the sutures and sewn to the abdominal wall. On one occasion, while securing a very long incision with through-and-through sutures, while passing the needle through the abdominal wall it broke, and the broken end came with great force against the anterior wall of the stomach and tore a hole in it. This I secured at once with suture and the accident had no bad consequences.

An unrecognized wound of the bowel in the course of a pelvic operation is almost certainly fatal. Accidental injuries, such as punctures and cuts, require immediate suture, and I have never known any harm follow. On the other hand, ragged tears in thickened and inflamed bowel require careful consideration in order to spare patients the inconvenience and distress of fæcal fistulæ.

In regard to small intestine a very small opening may occasionally be safely secured with fine silk, but in most cases it is wiser, if the bowel is thickened and inflamed around the hole, to resect well wide of the damaged portion and join the cut ends (circular enterorrhaphy).

Holes low down in the rectum are difficult to suture securely. These should be treated by drainage, using a wide rubber drain ; the convalescence will be tedious, but the fistula will close.

It is useful to remember that if the rubber tube be too long it may enter the hole in the bowel and thus maintain the fistula. On one occasion I was asked to close a fæcal fistula which had followed an oöphorectomy. This fistula persisted five years. At the operation I found a hole in the sigmoid colon with its margins adherent to the opening in the parietes, so that the tube passed directly into the bowel. The gut was detached and the opening closed with sutures, and it gave no further trouble.

If, in the course of an ovariotomy or hysterectomy, the surgeon discovers a cancerous stricture in the colon or cæcum he should resect the affected section, if it permits of this treatment ; otherwise lateral anastomosis should be performed. (See Vol. II.)

Intestinal obstruction. It is difficult to estimate with any approach to accuracy the relative frequency of intestinal obstruction after operations on the uterus and its appendages ; nevertheless the danger is real. The obstruction may be acute or chronic : it may occur within thirty hours of the operation or be delayed for months or years. The causes may be arranged under five headings :

1. Adhesions to the abdominal wound.
2. Adhesions to the pedicle, stump, or a raw surface in the pelvis.
3. Strangulation around an adventitious band.
4. Obstruction due to an overlooked cancer in the colon.
5. Strangulation in a sac formed by a yielding cicatrix.

The form of intestinal obstruction with which we are most concerned here arises shortly after the operation and in the course of convalescence ; it may be caused by adhesions to the abdominal incision, the pedicles, raw surfaces in the pelvis left after the removal of adherent cysts and tumours, and the cervical stump of a subtotal hysterectomy.

The subject is one of importance, for the complication is fairly common in the practice of some surgeons, and is one which it is very necessary to recognize, for unless measures of relief are undertaken promptly the patient surely dies.

From a careful study of the matter I have come to the conclusion that acute intestinal obstruction is more frequent after ovariotomy than after hysterectomy, and this is due to the fact that the stump or pedicle left after the removal of an ovarian tumour lies higher in the pelvis, and in closer relation to ileum and jejunum, than the cervical stump left after the removal of the uterus. This view also receives support from the fact that acute intestinal obstruction following hysterectomy is more frequent in the practice of those surgeons who perform subtotal hysterectomy improperly, and leave a large piece of the neck of the uterus sticking up like a median post in the floor of the pelvis. As far as I can judge from the scanty records relating to this complication after hysterectomy, it is the sigmoid colon which is most commonly adherent to the cervical stump. The best way of avoiding this accident is to remove the supravaginal cervix so freely that, when the peritoneum is closed over the incision in the floor of the pelvis, there is nothing visible except a narrow thin line of suture at the base of the bladder.

The only rational method of treating acute intestinal obstruction following operations in the pelvis, is promptly to reopen the abdomen and set

free the adherent coil of gut. Operations of this kind after hysterectomy are more often successful than when they are a sequel to ovariotomy, and this is, I think, due to the fact already mentioned, that when intestinal obstruction follows ovariotomy or oöphorectomy, the obstruction arises in the small intestine and is usually very acute and more dangerous; whereas after hysterectomy the obstruction affects, as a rule, the sigmoid colon, and though it may be fairly acute, is not nearly so dangerous, and gives far better results to operative treatment.

Perforating ulcer of the stomach and small intestine. A rare cause of death after ovariotomy or hysterectomy is a perforating ulcer of the stomach or jejunum. Since 1887 I have seen three cases. In each instance the patient died from septic peritonitis. Rosthorn lost a patient from perforating ulcer of the stomach after hysterectomy. Olshausen states that he has seen at least four examples of this accident.[1]

Injuries to the bladder. This viscus has been injured in a variety of ways during operations on the pelvic organs. An over-full bladder has been mistaken for an ovarian cyst and been punctured with a trocar before the mistake was discovered. When tumours are impacted in the pelvis the bladder is often pushed up into the hypogastrium; this happens with bilateral ovarian tumours, incarcerated fibroids, and especially with large cervix fibroids. When the bladder is pushed up care should be exercised in making the abdominal incision, or it will be cut. Punctures and incisions in the bladder should be immediately closed with sutures of fine silk.

The bladder is liable to be injured in the performance of subtotal and total hysterectomy, especially in the latter operation when separating it from the neck of the uterus. In the subtotal operation the risk arises chiefly in suturing the peritoneal flaps over the cervical stump, for the bladder is liable to be punctured with the needle as it lies close to the anterior flap.

Injuries to the ureter. Since the vulgarization of hysterectomy injuries to the ureters have become common; nearly all are inflicted in cases where the neck of the uterus is removed, as in total abdominal hysterectomy, and in vaginal hysterectomy, because the vesical segments of these ducts come into close relationship with it.

The injuries to which the ureters are liable in the course of hysterectomy are as follows:

1. One or both ureters have been included in the ligatures applied to the uterine arteries.

[1] Bland-Sutton, J. On Perforation of the Stomach and Small Intestine as a Sequel to Ovariotomy and Hysterectomy. *Journ. of Obstet and Gyn. of the British Empire*, 1909, xv.

2. One or both ureters have been cut or completely divided with scissors, or knife, in removal of the uterus.

3. A segment of a ureter 7 centimetres in length has been accidentally exsected.

4. One or both ureters have been compressed by clamps applied to restrain bleeding in the course of vaginal hysterectomy, and subsequently sloughed.

5. Ureters exposed in the course of 'radical' operations for cancer of the neck of the uterus often slough.

6. A ureter is sometimes transfixed by a needle and thread when sewing the layers of the broad ligament together in the course of a subtotal hysterectomy.

When a ureter has been injured during the performance of subtotal hysterectomy, and the accident has not been noticed at the time of the operation, the urine leaks into the connective tissue of the broad ligament and the extravasation may extend to the loin. When the urine leaks into the pelvis it will, in a few days, escape through the abdominal wound. In cases where the neck of the uterus has been removed, as in total or in vaginal hysterectomy, and the ureters have been injured, the leakage of urine through the vagina soon apprises the surgeon of the accident. When both ureters have been tied or clamped accidentally anuria is the immediate consequence.

When a ureter is injured in the course of an operation it is important that the surgeon should recognize the accident, as this enables him to deal with it at once.

The primary treatment for a ureter injured in the course of a pelvic operation depends in a large measure on the ability, judgement, and experience of the surgeon, as well as on the extent of the injury.

1. When a ureter is partially divided the opening may be closed with sutures of fine silk.

2. When the duct is completely divided the cut ends may be invaginated, the upper into the lower.

3. If a piece measuring 5 centimetres, or more, has been exsected two courses are open. (*a*) A ligature may be applied to the upper end with the prospect of causing atrophy of the kidney. (*b*) The kidney may be removed if its companion is healthy; otherwise the proximal end of the ureter should be secured in the wound, or be brought out through a stab-wound in the loin.

4. When the cut ends of a ureter cannot be safely joined, the proximal end should be engrafted into the bladder. Many cases have been successful, but there is reason to believe that when the ureter has been engrafted into the wall of the bladder the ureter becomes sclerosed and the lumen narrowed and obliterated.

The sclerotic obliteration of a ureter engrafted into the bladder is a slow process and it does not happen in every case. For example, Lockyer, in removing a fibroid which burrowed between the layers of the broad ligament, wounded the bladder and divided the right ureter; he sutured the hole in the bladder and removed the right kidney. During the twenty-four hours following the operation there was anuria. On reopening the abdomen and finding that the left ureter had been divided he engrafted its proximal end into the bladder, through the wound which had been already sutured. Convalescence was disturbed by a urinary fistula, but the woman recovered and reported herself in good health three years later.

When a ureter has been injured in the performance of total hysterectomy and is unnoticed, urine escapes by the vagina, and at first there is doubt whether the leak is due to an injury to the bladder or to a ureter. In such conditions the quantity of urine voided through the urethra is compared with that which escapes through the vagina. If the quantities be equal, the leak is in the ureter; the surgeon has to decide which ureter has been injured, but he need be in no hurry to determine this, for a fistula due to partial injury of a ureter sometimes closes; if it persist for more than three months it will not heal spontaneously.

In order to ascertain which ureter is injured the surgeon avails himself of the cystoscope. This instrument will not only enable him to determine the point, but he can sometimes learn whether a ureter is completely divided.

Jonas related the details of a case in which he performed total hysterectomy for fibroids and on the tenth day the nurse reported the escape of urine from the vagina. The urine voided from the bladder measured on the average fifty ounces, but it now fell to twenty-five ounces. On cystoscopic examination urine could be seen issuing from the right ureteric orifice; at first the left orifice could not be seen, but on careful watching a movement was detected similar to the contraction of a ureter discharging urine, but no fluid came from the opening. This aimless movement of the ureter, known as 'empty contraction', indicates that there is not complete interruption of the ureter. Such cases should have an opportunity of healing spontaneously. This happened to Jonas's patient.

When a ureteric fistula refuses to heal and the surgeon decides to remove the kidney, he not only satisfies himself cystoscopically to which kidney the cut ureter belongs, but he will be wise on exposing the kidney to inject a coloured fluid, such as methylene blue, into the pelvis of the kidney and then ascertain if it escapes by the leak before removing the organ. The danger of removing the kidney belonging to the undamaged ureter is real. Morris reported a case in which this happened: A woman had total hysterectomy performed for a cervical fibroid by a gynæcologist;

in the course of the convalescence a ureteral fistula was recognized, and as this failed to close spontaneously a surgical colleague performed nephrectomy, and the next day found to his chagrin that he had removed the kidney belonging to the uninjured ureter. Serious accidents of this kind are less likely to happen now, because the surgeon can avail himself of the cystoscope and ureteral catheter; with these instruments it is possible, not only to decide with certainty which ureter is injured, but also to determine the position and extent of the damage.

I was present at a hysterectomy when a gynæcologist cut three inches out of a ureter, mistaking the duct for an adhesion. He overcame the difficulty by firmly tying the proximal end of the cut ureter with a silk thread. The patient, a middle-aged woman, recovered without an untoward sign and remained well. This led me to take interest in this method of dealing with a cut ureter, and in 1909 I expressed the opinion that 'it is possible and probable that a ureter has been ligatured in the course of an operation, and the patient has recovered, without anyone having a suspicion that such an accident has happened'. Dr. J. D. Barney has collected and analysed the reports of sixty-two cases of injury to the ureter. Of these sixteen were bilateral and forty-six unilateral. The majority of the accidents occurred in the course of hysterectomy. He finds that sudden occlusion of a ureter by ligature often produces no symptoms; sometimes it is followed by pain and tenderness in the kidney, which subsides spontaneously. In some instances the accident is followed by hydronephrosis, and he reiterates the opinion expressed above that there is a strong probability that a ureter is often unconsciously ligatured.

A ureteral fistula is a serious matter for the patient. Dr. G. F. Blacker has had three of these accidents after total hysterectomy. In one the kidney was removed on account of septic changes The second had an attack of anuria lasting twenty-four hours; it passed off, she recovered, and the fistula healed. The third died eight weeks after hysterectomy with symptoms of pyæmia; a small abscess had formed near the site of the fistula.

When a fistula of the ureter has healed spontaneously the risks are by no means at an end, for the patient is liable to attacks of anuria, pyelitis, and pyæmia.

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The fate of ligatures. When a ligature is satisfactorily applied to a pedicle the tissue on the distal side of the ligature is isolated from the circulation. The fate of this tissue and of the ligature has been the subject of much speculation.

It is a matter of common observation that when animal tissues are cut off from the circulation, they atrophy; but if pathogenic micro-organisms gain access to such parts, suppuration ensues. In due course, through the activity of the living cells, the dead tissues are detached from the living, a process termed sloughing.

When a piece of healthy tissue is removed from the body and immersed in a sterile solution, and absolutely isolated from the atmosphere, decomposition is indefinitely postponed, but as soon as unsterilized air is allowed access to it, putrefactive changes ensue. The pedicle after ovariotomy is in an air-tight chamber, and if the tissues included by the ligature are healthy, and the silk employed for the purpose is absolutely aseptic, this pedicle, when returned into the abdomen, resembles the piece of tissue isolated from contact with the atmosphere. No septic changes occur, but aggressive leucocytes attack the silk and may, in course of time, effect its removal, even the knots. For this desirable result three conditions require to be fulfilled: (1) the ligatured tissue must be aseptic; (2) the ligature should be absolutely sterile; and (3) air or intestinal contents must be excluded.

These conditions may be prevented in many ways. The tissues included in the ligature are not always free from infective organisms, especially the uterine tube, which is usually included in the ligature, and this structure, especially in cases where oophorectomy is performed for inflammatory diseases, often contains septic microbes; this endangers the ligature and leads to the formation of pus, with its complications, sloughing of the pedicle and abscess The tissues may be healthy and aseptic, but the ligature may have been imperfectly sterilized, or become contaminated by assistants, or even by the hands of the surgeon during its application.

The operation may have been conducted aseptically and the tissues be healthy, but the ligature becomes infected by the admission of air as a result of drainage, or implication of the bowel or bladder.

I made a careful study of the fate of silk sutures employed in pelvic surgery extending over many years, and came to the conclusion that, even under favourable conditions, silk ligatures disappear very slowly. The silk used to secure an ovarian pedicle may, in very favourable circumstances, disappear in twelve months, but the knots require nearly double that time. The piece of silk which encircles the uterine tube is apt to behave in a curious way; in 1898 I removed an ovarian cyst

the size of a fist, and tied its slender pedicle with thin silk. Although the recovery was uneventful, the patient complained during many weeks of cramp-like pains on the side from which the cyst was removed. These pains gradually subsided, and ten months later, during menstruation, the patient noticed on the napkin a tiny loop of silk, which she saved. This was the loop of silk which secured the uterine tube; it had ulcerated into the tube and been conducted into the uterus and escaped. I have since had a like condition, the loop making its appearance three weeks after an ovariotomy. It has been established by experiments on the long uterine cornu of rabbits, that an encircling ligature will ulcerate through, leaving the lumen of the cornu intact. Clinical observations regarding ligatures applied to uterine tubes in the performance of Cæsarean section for the purpose of preventing pregnancy prove that this is a useless measure, for these tubes in many instances have recovered their patency, and pregnancy has recurred. It is a fair inference that the ligature ulcerates into the lumen of the tube, which then heals behind it, without stricture of the canal. A similar condition of things sometimes arises after Cæsarean section, especially when the uterine incision is closed by two layers of sutures. Those sutures which involve the endometrium will ulcerate into the uterine cavity and cause irregular slight losses of blood until they escape.

It is important to emphasize the fact that silk sutures in uterine tissue will, in some instances, remain unabsorbed for many years. A patient who had been submitted to Cæsarean section in 1903 came under my care four years afterwards for the removal of the tumour which caused obstruction; the sutures used to close the uterine incision were visible, and a microscopic examination showed that each silk suture was enclosed in a fibrous tissue sheath.

The fact that silk sutures will resist absorption for such a long period has an important practical bearing, because so long as pathogenic micro-organisms are denied access they remain inert, but if any septic condition arises in their neighbourhood, and these sutures become involved, they will give rise to abscesses and sinuses as surely as if they had been buried but a few days.

Patients often suffer great distress and annoyance on account of abscesses and sinuses due to septic ligatures, and a sinus will persist as long as the ligature remains. Abscesses and sinuses resulting from troublesome ligatures may escape in many directions; the most common spot is at the lower angle of the abdominal incision; the rectum is another channel of escape, and also the bladder. When a ligature makes its way into the bladder it will set up cystitis and serve as a nucleus for a vesical calculus. In an unusual case recorded by Edebohls, double oöphorectomy

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may have been required for the removal of infected cysts, or pelvic peritonitis: in these cases it is unwise to bury sutures.

Troublesome buried sutures should be removed. In many instances this is easy of accomplishment, and in others it requires patience and often perseverance, even when the patient is under an anæsthetic. The simplest implement for removing a buried suture is a crochet-hook.

The disadvantage of stitch-abscesses, apart from the inconvenience they cause patients during their convalescence, is that they often cause the scar to yield at that spot, and necessitate the wearing of an abdominal belt. If the hernia is of small extent, and especially when it is situated near the lower angle of the scar, it is difficult to fit a belt which will restrain it without the use of perineal bands or straps. In such cases a truss, on the principle of those employed for inguinal hernia, is more satisfactory than a belt.

Occasionally a scar forms a raised hard red keloid band, and causes some anxiety to the patient. These keloid scars shrink and whiten in the course of a year or eighteen months.

Cancer of the cicatrix. Several cases have been recorded in which, after the removal of an ovarian adenoma, a new growth, described as 'cancer of the cicatrix', has formed in the scar. These growths are probably due to the soiling of the wound at the time of operation with epithelial fragments from the tumours.

After abdominal hysterectomy for cancer of the body of the uterus, or its cervix, the abdominal wound may become infected with this disease, and in cases where exploratory cœliotomy has been performed for diffuse cancerous disease of the peritoneum the cicatrix is liable to become permeated by malignant disease also.

was performed for uterine fibroids; a year later the ligature on the left side escaped through the vagina; six months later he performed abdominal hysterectomy. The vermiform process was adherent to the stump on the right side; it was removed, and a silk ligature tied in a complicated knot was found in it, making its way towards the cæcum.

On one occasion a woman, who had been submitted to subtotal hysterectomy in the Antipodes, suffered from frequent micturition and fœtid urine; she came under my care. On dilating the urethra, it was found that the cervical stump had ulcerated through the posterior wall of the bladder and projected freely into the vesical cavity, bristling with thick silk ligatures encrusted with phosphatic deposit. The ligatures were removed, the urine soon became acid, and the vesical discomfort quickly subsided, in spite of the anomalous position of the cervical stump.

Until surgeons fully realized the importance of thoroughly sterilizing the silk employed for the pedicles in ovariotomy, it was quite common for the silk loops to ulcerate through the bladder wall and set up cystitis.

Many cases have been reported in which a loop of silk, effecting an entrance into the bladder in this fashion, has formed the nucleus of a phosphatic calculus.

Post-operative kraurosis. In a small proportion of patients (perhaps not more than 1 per cent.) who have undergone bilateral ovariotomy, oöphorectomy, or hysterectomy, the vulva undergoes the peculiar atrophic changes which are characteristic of the condition known as *kraurosis vulvæ*. This change, so far as my observations go, is chiefly seen in patients who have been submitted to these operations after the fortieth year of life. The cause of this change is unknown. The condition is troublesome and inconvenient in married women, but spinsters rarely complain of it. Post-operative kraurosis is as rebellious to treatment and its causation is as inexplicable as kraurosis occurring independently of operation.

The cicatrix. Although the employment of buried sutures has made abdominal incisions more secure in the process of healing, and renders them firmer after union, and thus reduces the chances of a yielding scar, and saves the patient the inconvenience of an abdominal hernia or the annoyance of wearing an abdominal belt, it renders the patient liable to another discomfort, namely, stitch-abscess. This complication arises from a variety of causes—for example, imperfect sterilization of the suture material, or of the patient's skin preceding the operation. The sutures may be soiled by the hands of nurses and assistants, or the fingers of the surgeon. All these things may be safeguarded, but the operation

SECTION III

OPERATIONS UPON THE VULVA, PERINEUM AND EXTERNAL GENITAL ORGANS

BY

JOHN PHILLIPS, M.A., M.D. (Cantab.), F.R.C.P.

Professor of Obstetric Medicine, Obstetric Physician and Gynæcologist, King's College Hospital.

CHAPTER I

OPERATIONS FOR INJURIES TO THE PERINEUM AND PELVIC FLOOR

The same general principles apply to the preparation of patients for operations on the perineum and vagina as for operations on other parts of the body. Very particular attention, however, must be paid to the bowels; nothing is more prejudicial to the success of an operation, or more annoying to the operator, than to have the area of operation soiled by an escape of fæcal matter from an imperfectly emptied lower bowel. The aperient should be given at least 24 hours before the time of operation. A copious soap-and-water enema should follow after the usual interval, and, an hour or two beforehand, the lower bowel should be thoroughly washed out with a gentle stream of warm water.

The external genitals should be shaved, and washed with ethereal soap solution and hot water the day before the operation, then douched with a 1–2,000 solution of perchloride of mercury, and a compress, soaked in the same solution, laid over the vulva. After the enema has acted, and after the final wash-out, the washing and douching should be repeated and a fresh compress applied. Painting the area of operation over with 2 % iodine and spirit lotion just before proceedings are commenced is a simple and efficacious proceeding.

If there is any vaginal discharge, the vagina should be douched out three times a day for two or three days previous to the operation with an antiseptic such as 1–4,000 perchloride of mercury, or 1 % formalin. The healing of a perineal wound is considerably impaired if it be continually bathed in an unhealthy vaginal discharge.

When the patient is on the table and under the anæsthetic, the external parts should again receive a thorough final disinfection, and, in addition, the vagina should be thoroughly swabbed out with ethereal soap solution, by means of swabs on holders. A final douching with 1–2,000 perchloride of mercury completes the process.

After the above preparations have been carried out, the patient is anæsthetized and placed on the table in the lithotomy position, the legs being kept well apart and fixed by means of a crutch. The buttocks are brought well to the edge of the table, and a Kelly's pad may be

procedures carried out for incomplete rupture of the perineum (colpoperineorrhaphy), prolapse of the pelvic floor, and to produce narrowing of the vagina.

The appearance of the parts in this condition is quite characteristic (Fig. 5); the laceration of the recto-vaginal septum appears as a triangular space with its apex upwards, its sides equal, and its base formed by the retracted sphincter ani (Fig. 7). The separated ends of the sphincter are seen as two slightly depressed circular spots at the base of each side of the isosceles triangle a, a_1. The object of the operation is to adapt these two ends, repair the recto-vaginal rent, and re-form the perineal body. There is often much irregular scar tissue about the opening, which may cause additional difficulty at the operation.

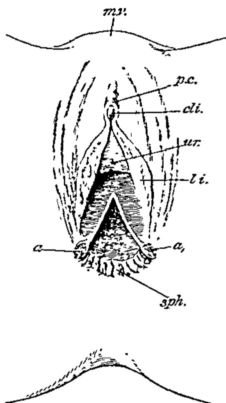


FIG 5. COMPLETE LACERATION OF THE PERINEUM. (*From a photograph.*)

a, a_1. Ends of torn sphincter ani.

cli Clitoris.

l.i. Labium internum.

m v. Mons veneris.

p c. Preputium clitoridis.

sph. Sphincter ani.

ur. Urethral orifice.

The instruments necessary are six Spencer Wells artery forceps, long dissecting forceps with hooked points, a pair of sharp-pointed angular and a pair of sharp-pointed curved scissors (see Fig. 6), flat curved needles and Schauta's needle-holder (Fig. 47).

The preparatory treatment consists in regular gentle purgation daily for a week, dieting, rest in bed for three days, and antiseptic vaginal douches of lysol (1 drachm to the quart).

Operation. The patient is placed in the dorsal position on a Kelly's pad, and after the usual purification, *denudation* is commenced. The skin over the circular depressions corresponding to the ends of the severed sphincter (Fig. 5, a, a_1) is seized with the dissecting forceps and slightly raised This portion of skin on either side is removed by means of the scissors, thus baring the ends of the sphincter and opening up the cellular tissue.

The point of one blade of the scissors is now buried in the cellular tissue at this bared spot on the operator's right side, and is carried along the free torn edge of the recto-vaginal septum between the deep

placed beneath them. The legs should be encased in sterilized towels or linen stockings, and towels placed on the hypogastrium (Fig. 4).

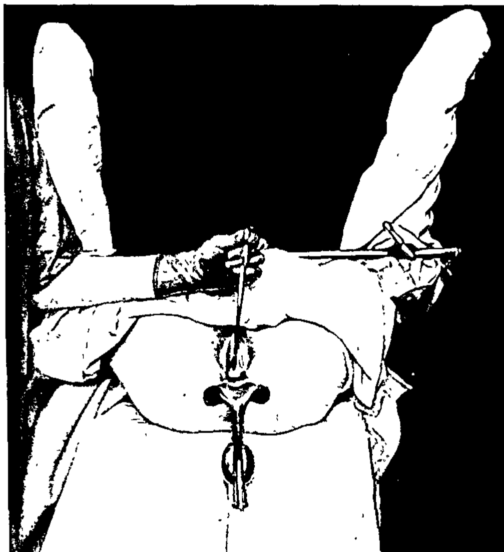
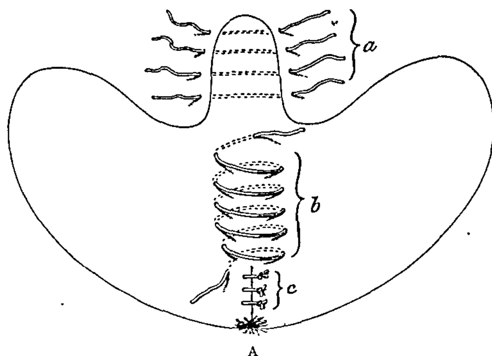


FIG. 4. PATIENT PREPARED FOR OPERATION. In lithotomy position with crutch applied, Auvard's speculum inserted, and volsella attached to the anterior lip of the cervix uteri. Kelly's pad is omitted for sake of clearness. (*From a photograph.*)

OPERATIONS FOR THE REPAIR OF COMPLETE LACERATION OF THE PERINEUM

Under the term *colporrhaphy* (suture of the vagina) is included any operation in which denudation and subsequent suturing of one or both walls of the vagina is carried out. Anterior colporrhaphy includes the various operations devised for cystocele; posterior colporrhaphy, the



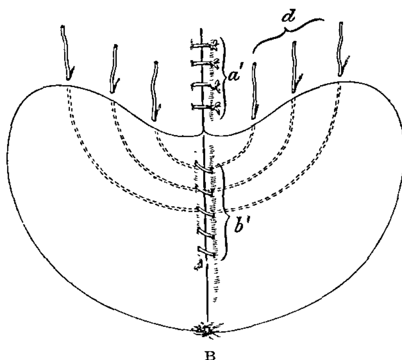


FIG 8. COMPLETE LACERATION OF THE PERINEUM. In A the 'butterfly' surface has been denuded and the recto-vaginal rent repaired (*c*).

a. Sutures passed through the sustaining column, but not tied.

b. The 'buried' spiral suture passed but not tied.

In B is shown the oval raw surface left to be brought together by sutures (*d*) after the buried suture (b^1) has been tied (*Diagrammatic.*)

and superficial tissues until the apex of the laceration is reached. A similar incision is made on the opposite side.

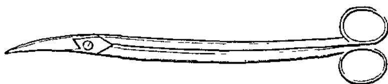


FIG. 6. LONG-HANDLED SHARP-POINTED SCISSORS CURVED ON THE FLAT.

The triangles of the vaginal flap are now raised by means of catch-forceps and the scissors passed carefully into the cellular tissue, and the recto-vaginal septum is slit transversely, producing a raw surface somewhat the shape of a butterfly in outline (Fig. 8). A median extension of the denudation is made in an upward direction for another inch in length to form a supporting column. This flap may, if the tissues are sufficiently redundant, be removed along the line running at its base. The raw surface should be swabbed over carefully, and any bleeding-points secured by ligatures. Large venous sinuses are very often opened, and, should the bleeding recur after the adaptation of the flaps, the operation will inevitably fail.

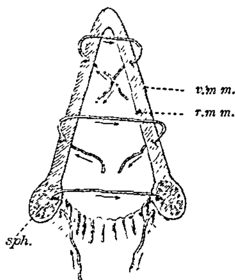


FIG. 7. COMPLETE LACERATION OF THE PERINEUM. Semi-diagrammatic drawing of a ruptured recto-vaginal septum, indicating the method of passing the sutures for its repair

r.m.m. Rectal mucous surface.

sph Torn end of sphincter ani.

v.m m. Vaginal mucous surface

The arrows indicate the direction of the sutures.

Closure of the recto-vaginal rent is first carried out by interrupted sutures, as is seen in the semi-diagrammatic drawing (Fig. 7). The threaded needle in a holder is passed from the rectal side of the flap through the flap on to the raw surface, then over the rent on to the raw surface of the other side; it finally finds its exit again on the rectal side of the flap. Four or more sutures may be passed in this way, a final one bringing the cut ends of the sphincter ani together. Each suture should be tied and the ends cut short before the next one is inserted, and the knots will lie just beneath the mucous membrane of the rectum.

We have now a large butterfly raw surface to deal with. The extension corresponding to the head is first of all dealt with by four or more

After-treatment. The patient's knees should be tied together, the urine drawn off by a catheter every six hours for the first 48 hours, and the wound kept as dry as possible. If the catheter is not used, the patient should pass her urine in the knee-elbow position: by this means the urine does not contaminate the wound. Throbbing and pain in the perineum with slight rise of temperature are generally indicative of suppuration taking place either between the flaps or along the sutures. A purge, preferably of castor oil, should be given on the morning of the third day and daily afterwards. If there are any scybala left in the rectum it is better to inject a little warm olive oil into it through a catheter before the bowels are expected to act.

The patient should be allowed to get up on the twenty-first day. There should be proper control of flatus and motions from the date of operation.

OPERATION FOR LACERATION OF THE PELVIC FLOOR

The objects of this operation are twofold: first, to secure the torn ends of the levator ani to the lateral vaginal sulcus and perineum; and, secondly, to draw up or lift the pelvic floor, which is more or less depressed.

The patient is placed in the lithotomy position and a retractor is inserted in the anterior cul-de-sac in order to elevate the anterior vaginal wall: Fig. 9 shows the appearances then seen. The left forefinger or some gauze packing is placed in the rectum and a double triangular space is denuded by means of sharp-pointed scissors, the base line of the double triangle being formed by the hymen. Two tenacula are inserted as indicated in the drawing (Fig. 9, *t,t*). The mucous membrane is now removed from the M-shaped space, great care being taken to penetrate deeply into the lateral sulci. After all bleeding has been arrested in the usual manner, the sutures should be passed. On the left-hand side of the figure these are indicated as inserted, not tied, whereas on the right they are tied and cut. Subsequently the somewhat quadrilateral raw surface which is left is brought together by five deep sutures, and the operation is complete. A Y-shaped cicatrix will be the result.

Cases in which the perineum is apparently intact, but in which the sphincter is not united (Figs. 10, 11).

These are the cases in which a complete laceration of the perineum is apparently completely healed after operation, but the patient finds that she has incontinence both of flatus and fæces.

separate sutures (Fig. 8, *a*). The large raw surface is now reduced in size by the passage of a deeply buried suture (Fig. 8, *b*); those used in the preceding manœuvres are best of silk. The buried suture should be catgut, and is passed in a spiral direction, as is seen in the diagram; the area of the raw surface is very much reduced by it (Fig. 8, *b*¹).

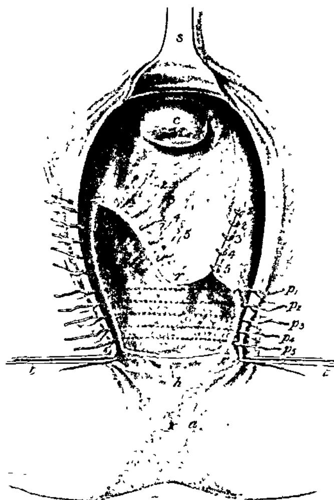


FIG. 9 LACERATION OF THE PELVIC FLOOR. The double triangular surface has been denuded (*Semi-diagrammatic, from a photograph*)

The sutures, 1–5, on the operator's right side are passed and tied; those on the left are passed but not tied

a Anus. *c* Cervix *h* Site of hymen.

p_1–p_5 Sutures passed through the quadrilateral denuded surface *r* recto-vaginal wall.

s. Speculum (Pozzi's anterior retractor)

t, *t* Tenacula

The arrow denotes the direction in which the sutures are passed

The parts to be brought together will now present the appearance shown in Fig. 8, B, and they are approximated by means of silk sutures, which are entered on the skin surface on one side, passed beneath the raw surface, and made to emerge on the skin surface on the opposite side. Four to six of these may be inserted.

Great care must be taken to see that no bleeding-points are left unsecured, and a current of hot 1 in 4,000 perchloride solution should be allowed to play over the surface, after which the sutures are tied. Each suture should be left about an inch and a half long in order to facilitate removal later on. A gauze drain should be passed into the vagina and an antiseptic gauze pad placed over the perineum.

On inspection of Fig. 10 this will be well explained. The patient is lying on her back in the lithotomy position: *a* represents the sphincter which has been torn through; the two cut ends, *b* and *c*, are represented by two dark circular, somewhat depressed spots. The rectal orifice gapes; there is no sphincteric power present. The perineum anterior to the anus is firmly healed.

Operation. The most certain and effectual method in these cases is to split up the healed perineum antero-posteriorly and treat the case as one of complete laceration of the perineum (see p. 45). This has been carried out in the case represented in the illustration Fig. 10, and Fig. 11 shows the result: the patient entirely recovered power over the sphincter ani and the sustaining power of the pelvic floor was much improved.

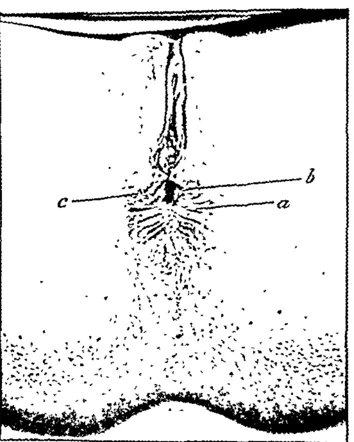


Fig. 10. Repair of a Lacerated Perineum, with Non-union of the Sphincter Ani, before a Plastic Operation. (*From a photograph.*)
a. Ununited sphincter ani.
b, c. Buried ends of torn sphincter.

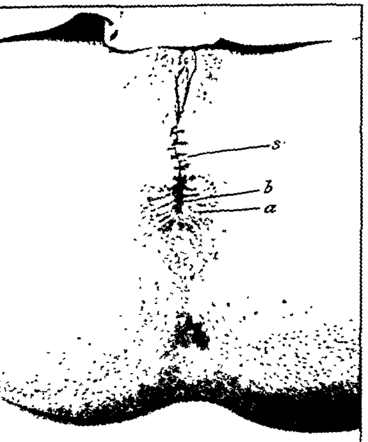


Fig. 11. Repair of a Laceration of the Perineum after a Plastic Operation. (*From a photograph.*)
a. Repaired sphincter ani. *b.* Anus.
s. Resutured perineum.

about $\frac{1}{4}$–$\frac{1}{3}$ of an inch from the raw edge (Fig. 19). Emmett's hook, shaped like a button-hook, is useful to produce counter-pressure against the needle point. The sutures are tied, and milk is injected into the bladder to test the accuracy of the union.

As a rule, fistulæ are bounded by rather scanty and inelastic walls, owing to the presence of cicatricial tissue; it is therefore more advantageous not to remove any tissue in order to produce a raw surface, or as little as possible. To fulfil this condition, the method of *dédoublement* or flap-splitting, as practised by Walcher, may be carried out (Fig. 18, A, B, and C).

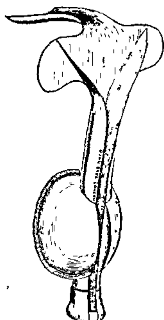


FIG. 12. AUVARD'S SELF-RETAINING SPECULUM.

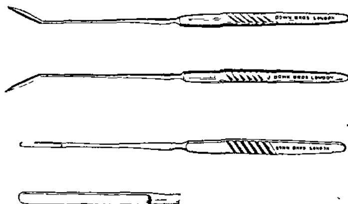


FIG. 13. KNIVES FOR FRESHENING THE EDGES OF A VESICO-VAGINAL FISTULA.

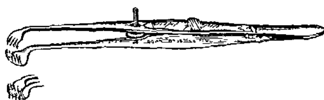


FIG 14 TOOTHED FORCEPS FOR USE IN VESICO-VAGINAL FISTULA.

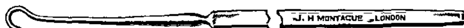


FIG. 15. EMMETT'S HOOK.

The patient is placed, as before, in the lithotomy position, and the cervix is pulled down, while the edges of the fistula are kept steady by a volsella on either side. The margin of the orifice is then split all round to a depth of from a quarter to half an inch. Vesical and vaginal

CHAPTER II

REPAIR OF A VESICO-VAGINAL FISTULA

OPERATIONS FOR VESICO-VAGINAL FISTULA

For simple vesico-vaginal fistula. This condition is fortunately very rare at the present time. Many operations have been devised for it, but the original one recommended by Sims, with subsequent modifications, appears to the author to be most efficient and applicable to the large majority of varieties of this accident.

Preparatory treatment. The chief object is to obtain a healthy condition of the fistulous edges, which are nearly always inflamed, thickened, and covered by urinary deposits, usually of a phosphatic character. These are best removed by means of a soft sponge or cotton-wool, and the raw edges treated with a weak solution of nitrate of silver (gr. ij to the ounce). Hot vaginal douches of lysol solution (ʒj to a quart) should be given night and morning, and the parts freely smeared with vaseline to protect them from the action of the irritating urine. Any cicatricial tissue which may be present around the fistula should be treated by submucous division.

Operation. The instruments necessary are: a Sims's or Auvard's (Fig. 12) speculum; two flat spatulæ; three long-handled knives (Fig. 13), one with a long haft and a short straight narrow blade, and the others with angular blades (right and left), two long-handled, sharp-pointed, curved scissors (right and left); an Emmett's hook for making counter-pressure (Fig. 15); toothed forceps (Fig 14) and tenaculum; six Spencer Wells's forceps; Schauta's needle-holder (Fig 47) with short curved needles.

The patient is placed in the lithotomy position. A strip of mucous membrane is then removed from the whole of the vaginal edge of the fistula by means of an angular knife. In the original operation Sims (Fig. 16) made the surface oblique, but Simon considered the raw surface should be at right angles to the mucous membrane (Fig. 17) The blade of the knife should not wound the vesical mucous membrane.

After the bleeding has ceased, the sutures, which may be of silk or catgut, are passed by means of the needle through the pared edge of the fistula on one side, passing across the fistula, and piercing the raw surface on the opposite side. The entry of the needle should be made

to the bladder, and the exposed raw surface a new anterior vaginal wall. The edges of this latter denuded surface are united by sutures, as in the operation of colporrhaphy.

2. Closure of the fistula by detaching the bladder from the vagina and suturing it independently is described and practised by Mackenrodt.

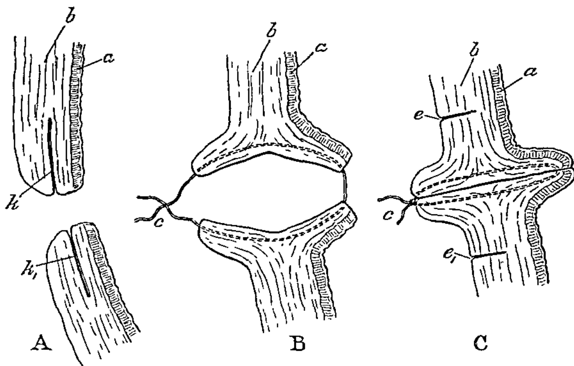


FIG. 18. REPAIR OF A VESICO-VAGINAL FISTULA BY DÉDOUBLEMENT.
A. The flap-splitting stage.
B. The flaps separated and the suture passed.
C. Suture tied, approximating the flaps.
a. Bladder mucous membrane *b*. Vaginal wall.
c. Suture. *e*, *e*,. Liberating incisions.
k, *k*,. Flap-splitting incisions

In A the flap-splitting is seen in section (*k*, *k*,), in B the flaps have been everted towards the bladder and vagina respectively and the suture passed. In C this suture has been tied; liberating incisions, *e*, *e*,, have been made on the vaginal surface to prevent tension in the wound

The patient is placed in the lithotomy position, and the fistula is exposed: the cervix is drawn downwards and backwards by means of a wire loop or tenaculum, and the urethral prominence held with a pair of hooked forceps. An incision is then made in the median line extending across the fistula and through the vaginal walls down to the bladder, in this way exposing the entire base of the bladder. The edges of the fistula are then split so that the bladder and the vaginal walls are separated. The two vesical flaps are now carefully and separately sutured by catgut and the edges of the vaginal wound are brought together as much as

mucous membrane flaps are thus produced, giving a large raw surface without any loss of substance. The sutures are passed as shown in Fig. 18, c.

After-treatment. This is very simple: if the patient is able, she should pass water, either in the dorsal or genu-pectoral position, otherwise a catheter should be passed every six hours.

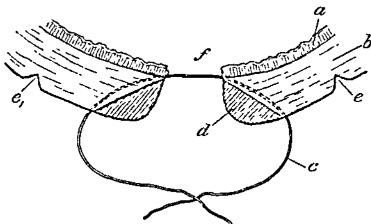


FIG. 16. SIMS'S OPERATION FOR THE REPAIR OF A VESICO-VAGINAL FISTULA.

a. Bladder mucous membrane. *b*. Vaginal wall.
c. Suture passed but not tied. *d*. Section of denuded surface.
e, *e*,. Liberating incisions *f*. The fistula.

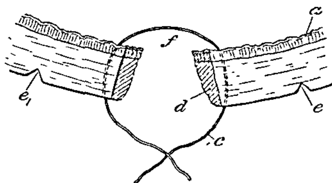


FIG. 17 SIMON'S OPERATION FOR THE REPAIR OF A VESICO-VAGINAL FISTULA. Letters as in the preceding figure.

Modifications of this operation have been devised, more especially for the larger fistulæ: they will be briefly mentioned.

1. Repair by turning up vaginal flaps to form the base of the bladder is recommended by A. Martin of Berlin. He first frees the adherent edges of the fistula and then raises the flaps from the vaginal wall and brings them over the opening, suturing them carefully together. By this method the mucous membrane of the vagina forms the new lining

Operation. If the sphincter ani is incompletely united, it will be found much the most satisfactory proceeding to divide the healed portions of the perineum and make a complete perineal laceration ; this may then be treated as described above (see p. 45).

If, however, the sphincter is intact and serviceable the fistula should be pared and the edges brought together by silk sutures. It is not infrequently necessary to perform a temporary colotomy (see Vol. II) in order to divert the fæcal contents of the bowel during the process of healing.

possible: if necessary, the fundus of the uterus may be used to assist in closing the opening.

For vesico-utero-vaginal or juxta-cervical fistula. In this affection the cervix is involved, and it must therefore be carefully differentiated from the vesico-vaginal variety, in which the cervix is intact.

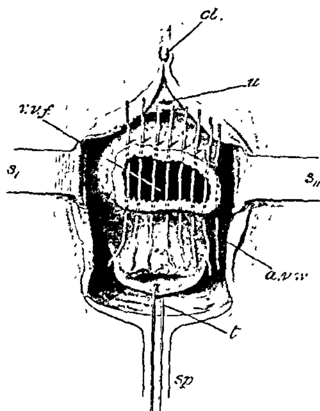


FIG. 19. REPAIR OF A VESICO-VAGINAL FISTULA. *Sims's Operation.* The edge of the fistula has been denuded and the sutures have been passed.
a.v.w. Anterior vaginal wall *cl.* Clitoris.
s,, s,,. Retractors. *sp.* Posterior speculum.
t. Tenaculum *u* Orifice of urethra
v.v f. Vesico-vaginal fistula.

In operating upon such cases the chief difficulty will be found in denuding the surfaces necessary for the introduction of the sutures, owing to the density of the cicatricial tissues, which are always present. This is best overcome by drawing the cervix forcibly downwards and backwards and incising the anterior cul-de-sac; the bladder wall with its fistulous opening is then dissected off the anterior surface of the cervix and carefully sutured independently of the cervical laceration; the latter is treated by suture in the usual way (see p. 45). In the deeper forms of juxta-cervical fistula, the above technique is impossible, and suprapubic incision and suture of the bladder must be substituted.

RECTO-VAGINAL FISTULA

This condition may be defined as an opening between the rectum and vagina through which flatus, or fæces, or both, may pass from the former into the latter; it is chiefly the result of an imperfect union subsequent to an operation for complete perineum laceration. It may also be caused by the rupture of a pelvic abscess or by the spread of primary malignant disease of the rectal wall.

recovery may follow, but it is very liable to recur, for infection lurks among the smaller ducts and is carried to a fresh part of the gland, and the process may continue until the whole gland has been thus destroyed.

Operation. The abscess must be freely incised and all pockets and septa broken down. It is stuffed with iodoform gauze, which is changed daily, and the cavity is allowed to granulate up from the bottom. If the abscess recurs, or if it consists only of a small collection of pus surrounded by brawny œdema, the whole gland should be excised.

OPERATIONS FOR ATRESIA OF THE HYMEN AND THE VAGINA

Occlusion of the hymen is the commonest form observed. The vagina becomes slowly distended with blood, forming an elastic pelvic swelling (hæmato-colpos) upon which the uterus is, so to speak, perched. Later in the course of the disease, this organ itself (hæmato-metra) and the uterine tubes (hæmato-salpinx) may become affected similarly.

Indications. In atresia of the hymen symptoms only commence after puberty; there is then congenital amenorrhœa with periodic pelvic pain and gradual formation of a pelvic swelling. On inspection the hymen is distended and the blood-tumour above it gives a bluish tint to its surface.

Operation. After administration of an anæsthetic, careful palpation of the tubes should be made *per rectum*: if they are distended it is better to open the abdomen, ligature and remove them; if not, the hymen should be incised by means of a cruciform opening and the characteristic tarry fluid allowed to escape no hypogastric pressure should be used.

Irrigation and packing with gauze may be resorted to as after-treatment, but are considered unnecessary by a large number of operators.

Atresia of the vagina may be congenital or acquired. In the latter case the condition results from contraction of adhesions developed from damage done during labour, or it may follow acute septic vaginitis, the introduction of acids or irritating materials to produce abortion, or as a sequel to typhoid fever.

Treatment is by slow dilatation with Hegar's bougies over an extended period of time, relapse is common.

DILATATION OF THE VULVAL ORIFICE

Indications. This is done for vaginismus due to a pathological spasm of the levator ani and resulting in more or less complete obstruction to coitus.

Operation. Under an anæsthetic the vulval orifice should be thoroughly dilated by means of the thumbs, and for some days

CHAPTER III

OPERATIONS UPON THE VULVA AND VAGINA

OPERATIONS UPON BARTHOLIN'S GLANDS

The bulbo-urethral glands, or glands of Bartholin, are two racemose structures about the size of a pea, lodged between the fascia of the urino-genital diaphragm, one on each side of the orifice of the vagina. Their ducts open a little in front of the fossa navicularis, on each side of the vaginal orifice, in the groove between the attached border of the hymen and the labium minus.

Removal of a cyst of the bulbo-urethral (Bartholin's) gland. These cysts really arise in the ducts rather than in the gland itself. The orifice of the main duct is very liable to become blocked from inflammation of the vulva, and leads to the formation of a single cyst varying in size from a cherry to an orange. Less common is the blocking of the secondary ducts, wherefrom a collection of small cysts results. The cyst forms a characteristic tense ovoid or pyriform swelling in the posterior third of the labium majus. The chief symptoms the patient complains of are discomfort in walking and pain on coitus.

Operation. The best procedure is complete excision of the cyst. A longitudinal incision is made over its cutaneous surface, and the cyst carefully dissected out, together with the gland itself: care must be taken not to perforate the vaginal mucous membrane stretched over the inner surface of the cyst. Brisk bleeding from vessels at the base of the cyst usually follows from the cavity which contained the cyst, and this must be carefully arrested, otherwise a large hæmatoma may result. The cavity is closed by five or six interrupted catgut sutures, passing deeply through its sides and floor, so as to ensure complete closure. A gauze drain may be inserted and retained for twenty-four hours or more, according to the depth and extent of the cavity.

The method of incising the cyst, swabbing its interior with undiluted carbolic acid, and packing it with gauze is not to be recommended, for cure is neither so rapid nor so certain as in excision.

Incision of an abscess of the bulbo-urethral gland. Abscesses arise by infection passing into the gland along the ducts, and are a very frequent accompaniment of gonorrhœa. The orifice of the duct can usually be seen red and prominent, and may exude pus if pressure be made over the abscess-sac. Sometimes the abscess bursts and spontaneous

recovery may follow, but it is very liable to recur, for infection lurks among the smaller ducts and is carried to a fresh part of the gland, and the process may continue until the whole gland has been thus destroyed.

Operation. The abscess must be freely incised and all pockets and septa broken down. It is stuffed with iodoform gauze, which is changed daily, and the cavity is allowed to granulate up from the bottom. If the abscess recurs, or if it consists only of a small collection of pus surrounded by brawny œdema, the whole gland should be excised.

OPERATIONS FOR ATRESIA OF THE HYMEN AND THE VAGINA

Occlusion of the hymen is the commonest form observed. The vagina becomes slowly distended with blood, forming an elastic pelvic swelling (hæmato-colpos) upon which the uterus is, so to speak, perched. Later in the course of the disease, this organ itself (hæmato-metra) and the uterine tubes (hæmato-salpinx) may become affected similarly.

Indications. In atresia of the hymen symptoms only commence after puberty; there is then congenital amenorrhœa with periodic pelvic pain and gradual formation of a pelvic swelling. On inspection the hymen is distended and the blood-tumour above it gives a bluish tint to its surface.

Operation. After administration of an anæsthetic, careful palpation of the tubes should be made *per rectum*: if they are distended it is better to open the abdomen, ligature and remove them; if not, the hymen should be incised by means of a cruciform opening and the characteristic tarry fluid allowed to escape: no hypogastric pressure should be used.

Irrigation and packing with gauze may be resorted to as after-treatment, but are considered unnecessary by a large number of operators.

Atresia of the vagina may be congenital or acquired. In the latter case the condition results from contraction of adhesions developed from damage done during labour; or it may follow acute septic vaginitis, the introduction of acids or irritating materials to produce abortion, or as a sequel to typhoid fever.

Treatment is by slow dilatation with Hegar's bougies over an extended period of time; relapse is common.

DILATATION OF THE VULVAL ORIFICE

Indications. This is done for vaginismus due to a pathological spasm of the levator ani and resulting in more or less complete obstruction to coitus.

Operation. Under an anæsthetic the vulval orifice should be thoroughly dilated by means of the thumbs, and for some days

CHAPTER III

OPERATIONS UPON THE VULVA AND VAGINA

OPERATIONS UPON BARTHOLIN'S GLANDS

THE bulbo-urethral glands, or glands of Bartholin, are two racemose structures about the size of a pea, lodged between the fascia of the urino-genital diaphragm, one on each side of the orifice of the vagina. Their ducts open a little in front of the fossa navicularis, on each side of the vaginal orifice, in the groove between the attached border of the hymen and the labium minus.

Removal of a cyst of the bulbo-urethral (Bartholin's) gland. These cysts really arise in the ducts rather than in the gland itself. The orifice of the main duct is very liable to become blocked from inflammation of the vulva, and leads to the formation of a single cyst varying in size from a cherry to an orange. Less common is the blocking of the secondary ducts, wherefrom a collection of small cysts results. The cyst forms a characteristic tense ovoid or pyriform swelling in the *posterior third of the labium majus. The chief symptoms the patient* complains of are discomfort in walking and pain on coitus.

Operation. The best procedure is complete excision of the cyst. A longitudinal incision is made over its cutaneous surface, and the cyst carefully dissected out, together with the gland itself: care must be taken not to perforate the vaginal mucous membrane stretched over the inner surface of the cyst. Brisk bleeding from vessels at the base of the cyst usually follows from the cavity which contained the cyst, and this must be carefully arrested, otherwise a large hæmatoma may result. The cavity is closed by five or six interrupted catgut sutures, passing deeply through its sides and floor, so as to ensure complete closure. A gauze drain may be inserted and retained for twenty-four hours or more, according to the depth and extent of the cavity.

The method of incising the cyst, swabbing its interior with undiluted carbolic acid, and packing it with gauze is not to be recommended, for cure is neither so rapid nor so certain as in excision.

Incision of an abscess of the bulbo-urethral gland. Abscesses arise by infection passing into the gland along the ducts, and are a very frequent accompaniment of gonorrhœa. The orifice of the duct can usually be seen red and prominent, and may exude pus if pressure be made over the abscess-sac. Sometimes the abscess bursts and spontaneous

(ii) The removal of fibro-myomata, ovarian tumours of small size, and early tubal pregnancies.

(iii) The drainage of collections of pus or the removal of the appendages in cases of acute inflammation where immediate operation is necessary.

(iv) *Conservative operations upon the uterine tubes or ovaries.*

(v) A preliminary to the performance of vaginal hysteropexy.

(vi) Those cases in which the patient's general condition is unfavourable to the performance of exploration by the abdominal route.

Anterior colpotomy is more suitable for removing small tumours growing from the anterior wall of the uterus, or for conservative operations on the ovaries. Posterior colpotomy is more suitable for removing

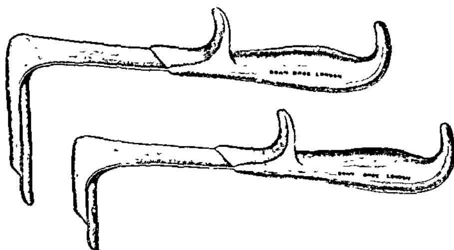


Fig. 21. Pozzi's Retractors.

inflamed appendages, and for evacuating collections of pus or blood from Douglas's pouch.

Posterior colpotomy has been used for many years for the opening of abscesses and hæmatoceles in Douglas's pouch. The anterior operation is of more recent date, and its relative advantages and disadvantages and the indications for its use have not yet been definitely agreed upon by the majority of gynæcologists. Taking all things into consideration, the disadvantages of colpotomy seem to outweigh its advantages, and, except for the evacuation or drainage of collections of blood or pus behind the uterus, the operation may be said to have few indications.

Anterior colpotomy. A posterior Pozzi's (Fig. 21) or Péan's retractor is passed into the vagina, and the cervix is seized with a volsella and drawn downwards and backwards. A sound passed into the bladder defines its lower limit. A T-shaped incision is now made through the vaginal mucous membrane, the transverse portion just below the point to

subsequently graduated Sims's 'vaginal rests' (Fig. 20) should be inserted twice daily and worn for twenty minutes at a time. This treatment may be necessary for a fortnight or longer. In many cases of dyspareunia the cause will be found to be due to a thick, fleshy, and unruptured hymen or to tenderness about the remnants of that organ. Under these circumstances, resection is the better plan to pursue. The hymen is seized with a pair of toothed forceps and removed with curved scissors along its entire base of attachment. Free bleeding often occurs from the raw surface, which must be controlled by ligatures. The two almost parallel cut edges must then be carefully brought together either by continuous or interrupted suture.

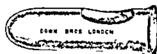


FIG. 20 SIMS'S VAGINAL REST.

COLPOTOMY OR VAGINAL CŒLIOTOMY

By colpotomy is meant making an opening into the peritoneal cavity through the vagina; the operation may be an anterior or posterior colpotomy, according to whether the opening is made through the anterior or posterior fornix.

Colpotomy has certain *advantages* over abdominal section. There is less interference with the peritoneum and intestines, and therefore less shock; if pus is present, there is less risk of infecting the general peritoneal cavity, and better drainage; there is no abdominal scar, and therefore no risk of hernia; lastly, there are certain pathological products which can be more easily reached by this route. The operation is difficult in a nullipara, where the vagina is narrow, and easier in a multipara, where the vagina is more capacious, and it is still easier if the cervix can be drawn down as far as the vaginal orifice.

A serious *disadvantage* is that, during the course of the operation, it may be found impossible to deal adequately with the conditions for which the operation is being performed; in the case of a tumour, for instance, its size, position, or the presence of adhesions may render it necessary to complete the operation by the abdominal route. Further, in more than one instance, the abdomen has had to be opened after the completion of the operation on account of bleeding, the source of which could not be dealt with by the vagina.

Therefore, before deciding upon the removal of a tumour by colpotomy, all the above points must be taken into consideration.

Indications. When the above conditions are fulfilled, colpotomy is suitable for :—

(i) The evacuation of collections of pus or blood in Douglas's pouch.

the tubes and ovaries can be drawn out of the wound and examined directly.

When the object of the operation has been attained, and all the blood has been carefully removed by swabs, the next and final step consists in closing the peritoneal and vaginal wounds. The uterus is replaced, and the peritoneal incision is closed by a single layer of catgut sutures; the vaginal incision is similarly dealt with. The vagina is cleared from blood-clot and gently irrigated with an antiseptic solution. A gauze plug is inserted lightly, and the patient is put back to bed. The catheter should be used every six or eight hours for the first twenty-four hours.

Posterior colpotomy. A posterior speculum is passed and the cervix drawn downwards and slightly forwards with a volsella. A transverse incision is then made through the vaginal mucous membrane at the junction of the posterior fornix with the cervix. This exposes the

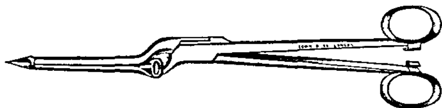


FIG. 23. MARTIN'S TROCAR FOR PELVIC ABSCESS.

peritoneum more or less easily, and this structure is picked up with catch-forceps, and a transverse incision made into it with scissors; a finger is passed through this, and the incision is extended on either side. The pelvic organs can now be explored and the tubes and ovaries drawn down and examined. The peritoneal and vaginal incisions are then closed by separate layers of catgut sutures.

To open a collection of pus in Douglas's pouch, the best method is to pass a pair of sinus forceps, with the blades closed, into the most prominent part of the swelling. The blades are then opened and the forceps withdrawn. The finger passed into the abscess cavity gently breaks down any adhesions. The cavity is then irrigated with hot salt solution and a drainage tube inserted, which projects just outside the vulva: the lower end of the tube should be carefully packed around with cyanide gauze. The tube should be changed every day and the vagina douched with an antiseptic. Another method is to plunge a Martin's trocar (Fig. 23) into any softened spot in the swelling and then withdraw the needle, leaving a blunt dilating forceps to extend the opening.

In opening an abscess the most stringent precautions against sepsis

which the bladder has been found to extend (Fig. 22, *b*). This incision should pass completely through the vaginal mucous membrane, but no farther, and should extend across the whole width of the anterior surface of the cervix. Some operators use a simple longitudinal or a transverse incision. The vaginal mucous membrane is now carefully pushed upwards with the pulp of the finger until the lower limit of the bladder is defined. Great help is gained at this stage by the use of the bladder sound. On pushing up the vaginal mucous membrane still farther the peritoneum is reached, and is recognized by its white glistening appearance, and by the fact that its two opposed surfaces glide freely over one another under the finger. The next step is to open the peritoneum: it is picked up with catch-forceps, and a small transverse incision is made into it with a pair of scissors; the finger is passed through, and the incision is extended on either side, care being taken not to pass too far outwards for fear of injuring the ureters or uterine vessels.

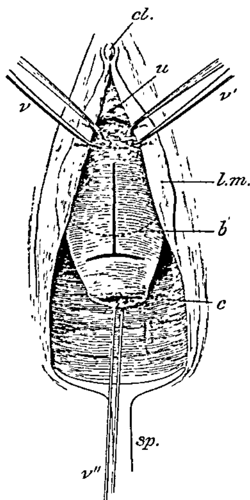


FIG. 22 ANTERIOR COLPOTOMY. The patient is in the lithotomy position, the speculum is passed and the cervix pulled down by a tenaculum The T-shaped incision has been made
b. Outline of bladder
c Cervix
cl. Clitoris.
l.m. Labium minus
sp. Speculum.
u. Urethral orifice.
v,v',v''. Volsella.

After the peritoneum has been opened, the pelvic organs can be carefully examined with the fingers, and the purposes for which the operation has been undertaken can be proceeded with. The next step usually consists in drawing out the fundus of the uterus, by which much more room and much better access to the pelvic organs is gained. To accomplish this, the uterus is caught with a volsella in the middle line, as high up as possible, and drawn downwards and forwards. If necessary, a second volsella is applied above the first, and so on, until the uterus is delivered. A very complete examination of the appendages can now be made, for

CHAPTER IV

OPERATIONS UPON THE UTERUS

PASSAGE OF THE UTERINE SOUND

This is an operation which is much less frequently resorted to than formerly, owing partly to the risks of sepsis attending its performance and partly to the greater perfection of the bimanual examination. Passing the uterine sound should always be looked upon as a surgical operation. The facts learnt by the use of the sound are: (1) the length and direction

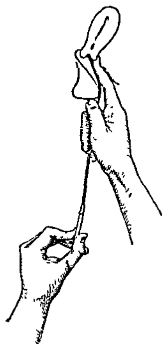


Fig. 24. The Passage of the Uterine Sound. *Introduction of the point into the external os uteri.*

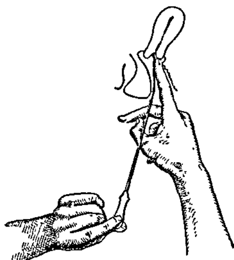


Fig. 25 The Passage of the Uterine Sound. *Commencement of the tour de maître.*

of the uterine cavity; (2) the condition of the endometrium: bleeding as a rule follows withdrawal in fibro-myomata and endometrial disease; (3) whether a fibroid growth is projecting into the uterine cavity, and if so, how much.

The sound may be passed in the dorsal position (Fig. 35), the cervix

should be observed. The vagina must be most carefully prepared beforehand, by rubbing over with swabs and ethereal soap, and by a subsequent copious douche of 1 in 1,000 perchloride of mercury: otherwise continual reinfection of the abscess cavity occurs, and healing is much delayed.

Lateral colpotomy—Paravaginal section.

Indications. The object of the operation is to increase the amount of room in the vagina in certain cases of vaginal hysterectomy in elderly virgins, or in women who have a small vagina.

Operation. The same preliminaries are carried out as before. The incision is carried completely round the cervix at its junction with the vagina. The lateral margin of the vulva is then held tense, and an incision is made, beginning at the circumcervical incision running down the lateral vaginal wall, through the margin of the vulva and on to the skin externally, ending at a point midway between the perineum and the ischial tuberosity, i. e. about 1½ inches to the side, and in front of the perineum; the incision may be lateral only or bilateral. In sewing up, it is important to re-unite the cut edges of the levator ani, or pelvic weakness will result.

may project into the lumen of the canal. (4) Congenital or acquired stenosis of the external os uteri.

When there is a septic discharge from the vagina, the sound should be passed in the dorsal position and through a speculum.

REPOSITION OF A CHRONIC UTERINE INVERSION

Indications. Chronic inversion of the uterus, with severe hæmorrhage and bearing-down pain. The uterine fundus presents in the vagina and simulates a fibroid polypus in process of extrusion.

Operation. This is most likely to be successful if continuous pressure be brought to bear against the inverted fundus while an attempt is made simultaneously to dilate the contracted cervix.

The patient is placed under an anæsthetic in the dorsal position and the whole hand is passed gradually into the vagina. The tips of the fingers and thumb should be pressed into the circular space at which the flexion of the walls of the body on the cervix has occurred. With the palm of the hand upward pressure is made, counter-pressure being exerted by the other hand over the lower hypogastrium. Reduction usually begins by a slight dimpling of the inverted fundus.

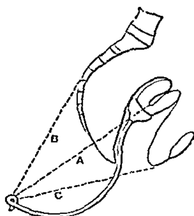


FIG 28. CHRONIC UTERINE INVERSION. Aveling's repositor in place with elastic cords A, B, and C, in action.

A more scientific method of exerting continuous pressure is by the application of Aveling's sigmoid repositor and elastic cords (Fig. 28). This instrument consists of a vulcanite cup into which is secured a steel S-shaped rod terminating below in a loop. The cup is made of various sizes and should always be smaller than the inverted fundus over which it fits.

After it has been applied, the instrument is carefully packed round with gauze to keep it in place. Two elastic bands in front and two behind are fastened by one end to the steel loop and by the other end to an abdominal belt. By this means constant and direct pressure is obtained on the fundus uteri in the direction of the pelvic axis.

Pain is usual and must be relieved by morphine. The cup usually elevates the fundus and corrects the inversion in about twenty-four hours, but as much as three days has been occupied in the process.

being held by a volsella and exposed by means of a posterior speculum, or in the left lateral position, the method usually adopted in the consulting-room. In the latter the right index-finger is passed up to the anterior lip of the cervix, the sterilized sound is taken in the left hand with its concavity backwards and its bulbous end is slid gently along the palmar surface of the finger in the vagina until the os uteri externum is reached; through this it should be passed for about a quarter of an inch (Fig. 24). The instrument should now be steadied by the thumb and the two distal joints of the second finger of the right hand, and its subsequent movements controlled by the left (Fig. 25).



Fig. 26. The Passage of the Uterine Sound. *Completion of the tour de maître.*

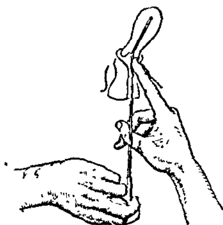


Fig. 27. The Passage of the Uterine Sound. *Entry of the sound into the uterine cavity.*

If the uterus is in a state of retroversion, the bulbous end will gradually enter the uterine cavity by pressing the handle of the sound forward and at the same time giving an upward and slightly backward impulse to its tip; the rough surface of the handle will be found to be looking towards the sacrum. Should the uterus be anteverted, the handle is held in the left hand as before and passed through an arc of a circle by raising the handle and turning it forward until it lies beneath the symphysis pubis, in the median line (*tour de maître*) (Fig. 26) The rough surface of the handle now looks anteriorly and the bulbous end is pressing against the internal os uteri, now bring back the handle directly to the perineum and it will glide into the uterine cavity (Fig. 27).

Difficulties to be met with will be: (1) An acutely anteflexed uterus; if traction is made on the cervix with a volsella the canal is straightened and the difficulty overcome. (2) Spasmodic contraction of the internal os uteri; this soon passes off with a little steady pressure. (3) A fibroid

(iv) *Frequent abortion in the early months.* Curetting often cures this by removing the diseased endometrium.

(v) *Inoperable carcinoma of the cervix.* Removal of the redundant portions of the growth by the curette, followed by cauterization or other measures, relieves the hæmorrhage and foul discharge. Great caution must be exercised, lest the peritoneum or bladder be opened into by the curette and the sufferings of the patient thereby increased. Cells of the disease may also be pushed into the pelvic lymphatics;

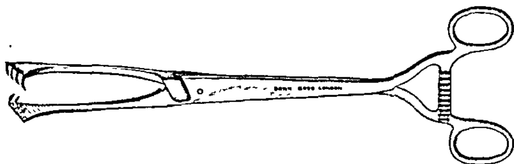


FIG. 29. VOLSELLA FOR FIXING THE CERVIX.

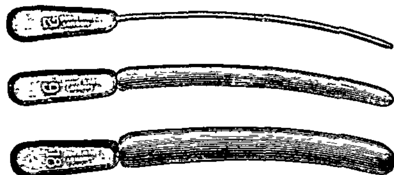


FIG. 30 HEGAR'S DILATORS (THREE SIZES) FOR DILATATION OF THE CERVIX UTERI

considerable febrile disturbance may also follow the operation. In this condition a blunt curette (Fig. 34, B) may be gently used; the same instrument is safest in abortion up to the eighth week of pregnancy; after this date it is better to use the fingers only.

Fragments removed by the curette are subjected to microscopical examination *for diagnostic purposes.* The various conditions which may have to be diagnosed are —

1. Carcinoma of the body of the uterus.
2. Retained products of conception.
3. Tuberculosis of the endometrium.
4. Chorio-epithelioma malignum.

CURETTING THE UTERUS—CURETTAGE

The term ' curetting ' is applied to the operation of scraping away the lining membrane of the uterus, either for the relief of some pathological condition or for diagnostic purposes.

The endometrium is not removed in its entirety by curetting, for the uterine glands dip down to a slight extent between the muscle-fibres of the uterine wall. The endometrium is removed as far down as the muscular coat, and, consequently, those parts of the glands lying amongst the muscular fibres are left intact.

Indications. These may be divided into the cases in which the operation is (1) remedial and (2) diagnostic in nature.

The diseased states of the endometrium are many and their exact pathology is still under discussion. It is, therefore, more practical to consider *the remedial indications for curetting* from the point of view of symptoms.

(i) *Uterine hæmorrhage* is the chief symptom which calls for curetting. The causes of the hæmorrhage may be *certain forms of endometritis*. Thus hæmorrhage is a prominent symptom of the so-called ' hypertrophic glandular endometritis ', a diffuse overgrowth or adenomatous condition of the endometrium, probably the after-result of a previous inflammation. There is one form which gives rise to specially profuse hæmorrhage—the ' polypoid ' or ' villous ' form, which arises usually in women over forty years of age.

The hæmorrhage from *fibro-myoma of the uterus* may require removal of the endometrium in order to relieve the bleeding temporarily at any rate. When milder measures fail, curetting is of great service in arresting the profuse menorrhagia which so often accompanies *subinvolution of the uterus.*

Certain cases in which the actual cause of the hæmorrhage is not evident are relieved by curetting ; amongst these are such conditions as arterio-sclerosis of the uterine vessels.

(ii) *A leucorrhœal discharge* is another symptom for which curetting is sometimes indicated.

It may be called for when the endometrium is congested and œdematous from such conditions as displacements of the uterus and chronic subinvolution.

It is better not to curette for a purulent uterine discharge ; extension of the infection may be caused and give rise to pyosalpinx.

(iii) *Sterility.* Curetting should follow dilatation, in the hope that the new endometrium formed may afford a better nidus for the ovum.

reached. In spite of the most careful attention it is very difficult to remove the endometrium completely. If a uterus be scraped, as it is thought, thoroughly, and be examined *post mortem*, strips of mucous membrane will often be found untouched, showing the difficulties of complete removal.

After the operation an intra-uterine douche of 1 in 2,000 perchloride of mercury or some other suitable antiseptic is given with a Bozemann's

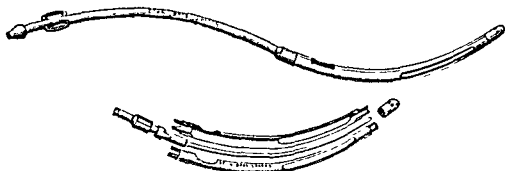


FIG. 32. BOZEMANN'S DOUBLE-CHANNELLED TUBE.

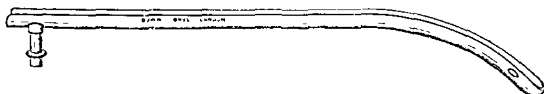


FIG. 33 BUDIN'S CELLULOID CATHETER.

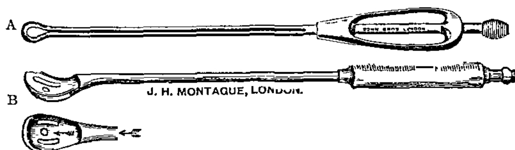


FIG. 34 A, MURRAY'S FLUSHING CURETTE, B, BLUNT CURETTE.

tube or Budin's catheter. If a flushing curette has been used, this of course has already been done After the douche, some application may be made to the interior of the uterus: the best is iodized phenol (liquid carbolic acid, 2 parts, tincture of iodine, 1 part). To do this the interior of the uterus is first dried with a Playfair's probe armed with cotton-wool; another similar probe is then taken, dipped into the solution, and passed into the uterus. The vagina is protected by inserting a plug of cotton-wool into the posterior fornix. The uterus is then lightly

Operation. The following instruments are required: a volsella (Fig. 29); a self-retaining weighted speculum (Fig. 12); uterine dilators (Figs. 30, 31); a uterine sound; a Bozemann's tube (Fig. 32); Budin's celluloid catheter (Fig. 33); and one or other flushing curettes.

There are many varieties of curettes, and each has its own adherents. The most generally useful is Murray's sharp flushing curette, which has a groove for the recurrent flow (Fig. 34, A). There are many varieties of blunt curettes. The model depicted in Fig. 34, B, enables the operator to clear out the uterine cornua and is of the best shape.

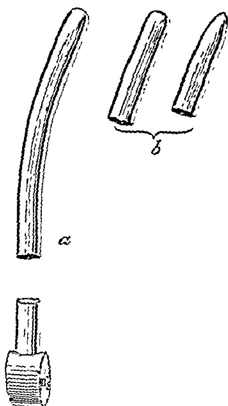


FIG. 31. METAL BOUGIES FOR DILATATION OF THE CERVIX.
a. As used by the author.
b. Ends of bougies considered unsuitable.

The patient is placed in the lithotomy position and the various antiseptic precautions already described are carried out. A speculum is passed and the cervix is steadied by a volsella applied to the anterior lip.

The cervix is first dilated up to a suitable degree for the passage of the curette; up to No. 12 Hegar is usually sufficient. The curette is now taken and passed into the uterus. In performing the operation a definite plan should always be followed so as to ensure that no part of the uterine cavity is missed. The curette is passed up to the top of the fundus uteri with its cutting edge directed to the posterior wall. It is then drawn downwards with steady pressure to just below the internal os. It is then again passed upwards and the manœuvre repeated with just sufficient change of direction to ensure the curette passing over fresh tissue. This is repeated until the whole of the posterior wall has been thoroughly dealt with from side to side. The anterior wall and sides of the uterus are then treated in turn in the same way. Finally the fundus is curetted by a lateral movement of the instrument, especial attention being paid to the uterine tube angles, which are very apt to escape the curette.

A rasping or grating sound indicates that the endometrium over a given part has been removed and that the muscular walls have been

reached. In spite of the most careful attention it is very difficult to remove the endometrium completely. If a uterus be scraped, as it is thought, thoroughly, and be examined *post mortem*, strips of mucous membrane will often be found untouched, showing the difficulties of complete removal.

After the operation an intra-uterine douche of 1 in 2,000 perchloride of mercury or some other suitable antiseptic is given with a Bozemann's

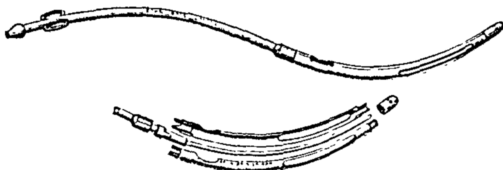


FIG. 32. BOZEMANN'S DOUBLE-CHANNELLED TUBE.

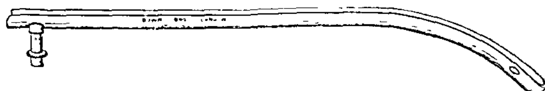


FIG. 33. BUDIN'S CELLULOID CATHETER.

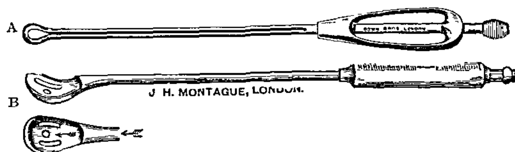


FIG. 34 A, MURRAY'S FLUSHING CURETTE, B, BLUNT CURETTE.

tube or Budin's catheter. If a flushing curette has been used, this of course has already been done. After the douche, some application may be made to the interior of the uterus: the best is iodized phenol (liquid carbolic acid, 2 parts; tincture of iodine, 1 part). To do this the interior of the uterus is first dried with a Playfair's probe armed with cotton-wool; another similar probe is then taken, dipped into the solution, and passed into the uterus. The vagina is protected by inserting a plug of cotton-wool into the posterior fornix. The uterus is then lightly

packed with ribbon gauze. If there is hæmorrhage, the packing should be firmer, and a vaginal tampon should be placed in below the cervix. The packing should be removed in twenty-four hours. The patient may get up at the end of a week, and resume her ordinary duties in a fortnight.

DILATATION OF THE CERVIX

Indications. Dilatation may be performed:

(i) As a means of diagnosis.

(ii) As a preliminary to the use of the curette or to removal of intra-uterine growths.

(iii) As a method of cure for spasmodic dysmenorrhœa.

Contra-indications to the rapid method of dilatation of the cervix are very few: a recent attack of peri- or para-metritis would certainly be one, but when the effects of a salpingitis have quieted down there seems very little reason against its use. Where carcinoma of the body of the uterus is known to exist, and in old age, it should only be resorted to with the greatest caution, if at all.

Methods:

(*a*) Rapid dilatation by means of graduated metal bougies.

(*b*) Gradual dilatation by means of tents.

(*c*) Combined gradual and rapid dilatation.

In a large majority of cases rapid dilatation is the operation selected. Its one disadvantage is that when a great degree of dilatation is necessary, or when the operation is performed too rapidly, the cervix is liable to be torn, an event which is especially liable to occur when the tissues of the cervix are rigid. These lacerations are longitudinal in direction and in the neighbourhood of the internal os uteri. They sometimes result in hæmorrhage, which can easily be controlled by plugging the cervical canal. Unless strict asepsis be maintained, these lacerations of course form a channel for infection of the pelvic cellular tissue.

It is obvious that dilatation will be easier to perform, and laceration less liable to occur, if the cervix is in a softened condition—a physiological state which is always present during pregnancy and labour. Efforts should therefore be directed, when possible, to ensure a soft state of the cervix before performing rapid dilatation.

Immediately after the cessation of a period, the cervix is soft and somewhat patent, and advantage may be taken of this fact. The introduction of a glycerine tampon two hours beforehand produces a certain amount of softening. But nothing ensures so much softening as the

introduction of a tent into the cervix about twelve hours previous to the rapid dilatation.

It is therefore recommended in all cases, where possible, to perform dilatation by this latter means, viz. a combination of the gradual and rapid methods.

Rapid dilatation by means of graduated metal bougies. Hegar's original dilators (Fig. 30) were solid vulcanite bougies, graduated from 1 to 26, the numbers corresponding to the diameter of the bougie in millimetres. Each was 5¼ inches in length, the handle measuring 1½ inches and the bougie the remainder. The bougie formed a slight curve and tapered off to a blunt point.

These bougies were rather short and too sharply pointed, and they could not be sterilized by boiling. To overcome these disadvantages uterine dilators are now made about the same length as a male catheter, with a sharper curve than Hegar's original one, and a blunter point; the larger sizes are of hollow metal for the sake of lightness. There are many varieties of dilator, each with minor differences as to length, curve, handle, and shape of the point.

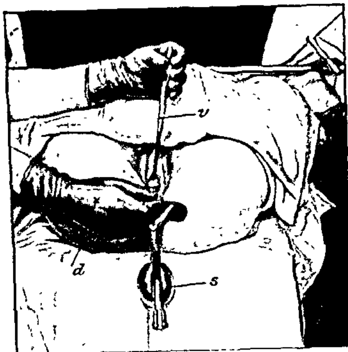


FIG. 35. DILATATION OF THE CERVIX. The patient is in the lithotomy position. Auvard's speculum has been inserted, a volsella attached to the anterior cervical lip and a bougie passed. (*From a photograph*)
d. Right hand inserting bougie.
s. Speculum. *v*. Volsella.

The author uses metal bougies These have somewhat the shape of the ordinary uterine sound, are thirty-five in number, and graduated in size. Like the sound, the upper portion is bent at an angle of about 160° with the solid handle, a circular shallow depression indicating the 2½ inch mark in the smaller numbers; in the larger this is not considered necessary.

Operation. Instruments: an Auvard's self-retaining weighted flushing speculum; a volsella; a Bozemann's tube or Budin's catheter; a uterine sound; and a set of dilators.

The patient is anæsthetized and placed in the lithotomy position with the legs supported by a crutch. Strict asepsis must be observed; the labia must be shorn of long hairs; this is followed by cleansing of the vagina and a vaginal douche, and finally the vulva is washed with antiseptic lotion. The speculum is passed and held by an assistant, but if self-retaining, as in Fig. 35, the assistant is not necessary: a sound is then inserted to ascertain the length and direction of the uterine cavity. If anteflexion be present, the anterior lip of the cervix should be seized with the volsella and fixed by slight traction. If retroversion or retroflexion be present, then the posterior lip should be fixed. Traction by the volsella tends to straighten out the uterine canal, and thus makes the passage of the bougies easier. The bougies are now passed in order, commencing with the size which will pass easily. The bougie is passed by means of the right hand into the cervical canal until the internal os uteri is reached; resistance will now be felt. Firm and continuous pressure in the proper direction must be made, and in a short time the resistance gives way, and the bougie will pass into the uterine cavity. An interstitial fibroid produces a tortuous channel and much difficulty will often be experienced in passing a bougie in such a case. It will be found on attempting to withdraw the instrument that it is grasped by the internal os uteri; in the course of one to five minutes this spasm will relax, and only then should the bougie be withdrawn. The next in size should be ready and introduced in the same manner, and the succeeding ones are inserted until the required dilatation is produced. Sterilized vaseline or glycerine of perchloride of mercury may be smeared over the point of the dilator to facilitate its passage. Each succeeding bougie should increase in size by not more than 1 mm.: occasionally a case is met with where this seems too large a difference, and it is really better to have them made with a ½ mm. difference. As a preliminary to the use of the curette, dilatation up to No. 12 Hegar is necessary. The index-finger can be introduced into the uterine cavity after the passage of No. 19 or 20 Hegar, while full dilatation up to No. 26 is required for any operation with scissors or the écraseur on intra-uterine growths.

It is evident that the degree of dilatation for exploratory purposes will be governed by the diameter of the operator's finger, or rather of its second joint, and this varies very much in different people. By means of the finger a uterus can be explored in which the cavity is much longer than the operator's finger, if the viscus be forced down on to the finger by the pressure of the other hand above the symphysis pubis. The operator must not be satisfied until he has felt the whole extent of the uterine wall, especially the two cornua, which are favourite seats of disease. After completion of the operation it is well to give an antiseptic

intra-uterine douche by means of a Bozemann's tube. The uterus and cervix should be lightly packed with sterile ribbon gauze, 1 inch wide; the free end is left projecting through the os uteri. The packing should be removed in twenty-four hours, and an antiseptic douche given.

Difficulties and dangers. The difficulty due to non-dilatability is overcome by means of the preliminary use of a tent. The complication produced by a fibroid, altering the direction of the uterine canal, has been mentioned. Extreme anteflexion or retroflexion gives trouble during the passage of the earlier numbers, but as dilatation is effected this disappears.

The dangers are:—

1. Laceration of the cervix.
2. Rupture of the uterus.
3. Sepsis and its sequelæ.
4. Hæmatoma between the layers of the broad ligament.

Laceration of the cervix has been referred to: it begins as a rule at the internal and extends towards the external os uteri; it may be deep or superficial, and is recognized as a sulcus into which the finger can be passed from above downwards: rarely, laceration into the peritoneum may take place.

Rupture of the uterus is liable to occur when the uterine wall has been weakened by the changes which accompany the completion of the menopause, or has been infiltrated by carcinoma, or, more rarely, by vesicular mole.

Sepsis may occur from absorption through a laceration if asepsis has not been maintained: it may lead to an attack of pelvic cellulitis or even septicæmia.

If the uterus is fixed or not freely mobile, and the condition is complicated by any tubal or ovarian disease, great care must be exercised in manipulation.

Gradual dilatation by tents. There are three varieties of tents—sponge, laminaria, and tupelo.

Sponge tents should never be used, for they are extremely difficult to render sterile.

The commonest and the safest to use, because they can be most easily sterilized, are laminaria tents, made from sea-tangle (*Laminaria digitata*). These are cylindrical rods, which expand evenly, from imbibition of moisture. Tupelo tents are larger than laminaria and expand more rapidly.

To use tents that are not absolutely sterile is to court disaster, and in former times they were responsible for many fatalities from sepsis. The best way to keep laminaria and tupelo tents is in a solution of 1 in 1,000

The patient is anæsthetized and placed in the lithotomy position with the legs supported by a crutch. Strict asepsis must be observed; the labia must be shorn of long hairs; this is followed by cleansing of the vagina and a vaginal douche, and finally the vulva is washed with antiseptic lotion. The speculum is passed and held by an assistant, but if self-retaining, as in Fig. 35, the assistant is not necessary: a sound is then inserted to ascertain the length and direction of the uterine cavity. If anteflexion be present, the anterior lip of the cervix should be seized with the volsella and fixed by slight traction. If retroversion or retroflexion be present, then the posterior lip should be fixed. Traction by the volsella tends to straighten out the uterine canal, and thus makes the passage of the bougies easier. The bougies are now passed in order, commencing with the size which will pass easily. The bougie is passed by means of the right hand into the cervical canal until the internal os uteri is reached; resistance will now be felt. Firm and continuous pressure in the proper direction must be made, and in a short time the resistance gives way, and the bougie will pass into the uterine cavity. An interstitial fibroid produces a tortuous channel and much difficulty will often be experienced in passing a bougie in such a case. It will be found on attempting to withdraw the instrument that it is grasped by the internal os uteri; in the course of one to five minutes this spasm will relax, and only then should the bougie be withdrawn. The next in size should be ready and introduced in the same manner, and the succeeding ones are inserted until the required dilatation is produced. Sterilized vaseline or glycerine of perchloride of mercury may be smeared over the point of the dilator to facilitate its passage. Each succeeding bougie should increase in size by not more than 1 mm.: occasionally a case is met with where this seems too large a difference, and it is really better to have them made with a ½ mm. difference. As a preliminary to the use of the curette, dilatation up to No. 12 Hegar is necessary. The index-finger can be introduced into the uterine cavity after the passage of No. 19 or 20 Hegar, while full dilatation up to No. 26 is required for any operation with scissors or the écraseur on intra-uterine growths.

It is evident that the degree of dilatation for exploratory purposes will be governed by the diameter of the operator's finger, or rather of its second joint, and this varies very much in different people. By means of the finger a uterus can be explored in which the cavity is much longer than the operator's finger, if the viscus be forced down on to the finger by the pressure of the other hand above the symphysis pubis. The operator must not be satisfied until he has felt the whole extent of the uterine wall, especially the two cornua, which are favourite seats of disease. After completion of the operation it is well to give an antiseptic

by a knife or scissors. A certain amount of retraction of the stump takes place, producing an inversion of the vaginal wall. The raw surface remaining must be covered by uniting the vaginal and cervical mucous membranes. Sutures are passed in the following manner: a short, stout, straight needle, threaded with a loop of silk, is passed from the vaginal mucous membrane, across and beneath the raw surface of the stump, and emerges on the mucous membrane of the cervix (Fig. 37). From eight to ten of these sutures are passed at regular intervals and tied.

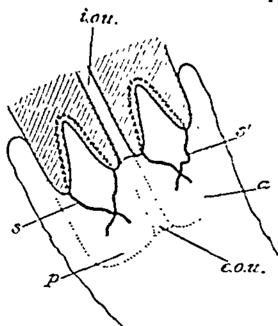


FIG. 36. MARCKWALD'S OPERATION FOR CONGENITAL HYPERTROPHY OF THE CERVIX. The wedge-shaped portions have been excised and the sutures passed but not tied.

a, *p*. Anterior and posterior lips of cervix before exsection.

e.o.u. External os uteri.

i.o.u. Internal os uteri.

s, *s'*. Sutures.

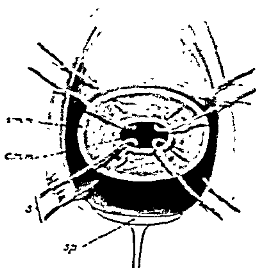


FIG. 37 HEGAR'S OPERATION FOR SUPRAVAGINAL ELONGATION OF THE CERVIX. The cervix has been removed and four sutures passed but not tied.

c.m.m. Cervical mucous membrane.

s. One of the sutures.

sp. Speculum.

v.m.m. Vaginal mucous membrane.

The sutures are removed on the tenth day and the patient should be kept in bed for fourteen days.

TRACHELORRHAPHY

Indications. This operation is performed for the repair of certain forms of laceration of the cervix. It was formerly practised in every case in which a laceration occurred: it is now only permissible in cases in which there is extroversion of the mucous membrane with

corrosive sublimate in absolute alcohol. They may be kept in this for an indefinite period, and so are always ready for use.

Contra-indications. All septic states of the uterus and cervix, for the retention of pent-up discharges is very likely to lead to local or general infection. Tents should never be used then in such conditions as carcinoma of the body of the uterus, sloughing polypus, acute endometritis and cervicitis.

Method of introduction of a tent. The patient is placed in the lateral or lithotomy position and a vaginal douche given. A Sims's speculum is passed and the cervix seized and drawn down with a volsella so as to straighten the cervical canal. The direction and length of the uterine cavity is ascertained by passing the sound. The most suitable size of tent is now selected, and, being held in a special form of tent introducer or suitable pair of forceps, is passed into the cervical canal, well past the internal os uteri. The end should project slightly into the vagina. The vagina should then be douched again and lightly packed with sterilized gauze. The patient must remain in bed.

The tent should be left in position for twelve to fifteen hours, when it will have exerted its full action. The action of tents is twofold: it causes (1) dilatation, and (2) softening of the cervix, the softening being accompanied by an abundant secretion of mucus from the cervical glands.

Method of removal. Tents are removed by traction on the silk thread attached to the vaginal end. The part of the cervical canal which exerts the greatest resistance to the dilating action is the internal os uteri, and after the tent has been removed a well-marked constriction is always to be seen at this point. It there is much resistance to removal by reason of the tent being gripped at the internal os, it should be taken in a pair of forceps and gently pulled and levered out.

OPERATIONS FOR HYPERTROPHY OF THE CERVIX

This is a congenital condition and there is no thickening of the mucous membrane and underlying tissues, hence the diameter of the cervix is not increased. The operation best adapted for the treatment of this condition is the wedge-shaped incision, recommended by Marckwald (Fig. 36).

Operation. The cervix is split bilaterally into an anterior and posterior portion by means of scissors, and out of each portion is excised a wedge-shaped piece of tissue, leaving a deep groove. The sutures are passed as in Fig. 36, and the raw surfaces are brought together.

Circular amputation, as carried out by Hegar, is more suitable for supravaginal elongation of the cervix, the result of prolapsus uteri.

The patient is anæsthetized and placed in the lithotomy position and the cervix is pulled down by a volsella and amputated transversely

by a knife or scissors. A certain amount of retraction of the stump takes place, producing an inversion of the vaginal wall. The raw surface remaining must be covered by uniting the vaginal and cervical mucous membranes. Sutures are passed in the following manner: a short, stout, straight needle, threaded with a loop of silk, is passed *from* the vaginal mucous membrane, across and beneath the raw surface of the stump, and emerges on the mucous membrane of the cervix (Fig. 37). From eight to ten of these sutures are passed at regular intervals and tied.

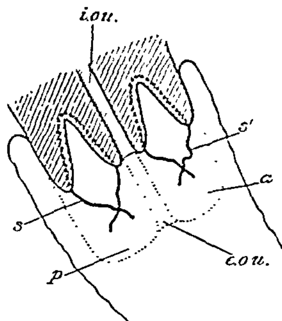


FIG. 36. MARCKWALD'S OPERATION FOR CONGENITAL HYPERTROPHY OF THE CERVIX. The wedge-shaped portions have been excised and the *sutures* passed but *not* tied.

a, p. Anterior and posterior lips of cervix before exsection.

e.o.u. External os uteri.

i.o.u. Internal os uteri

s, s'. Sutures.

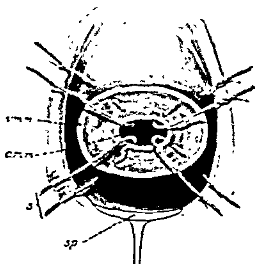


FIG. 37. HEGAR'S OPERATION FOR SUPRAVAGINAL ELONGATION OF THE CERVIX. The cervix has been removed and four sutures passed but not tied.

c.m m. Cervical mucous membrane.

s. One of the sutures.

sp. Speculum.

v.m m. Vaginal mucous membrane.

The sutures are removed on the tenth day and the patient should be kept in bed for fourteen days.

TRACHELORRHAPHY

Indications. This operation is performed for the repair of certain *forms of laceration of the cervix.* It was *formerly* practised in every case in which a laceration occurred: it is now only permissible in cases in which there is extroversion of the mucous membrane with

certain symptoms, such as hæmorrhage or free leucorrhœal discharge accompanied by backache on exertion and general ill-health. It was formerly considered that there was a direct relation between cervical laceration and cancer, but further inquiry has failed to corroborate this view.

The instruments required are: a Sims's or Auvard's speculum; long-handled, angular-bladed knives (right and left); Emmett's scissors (right and left) (Fig. 38); toothed dissecting forceps; short stout needles with sharp triangular points, straight or very slightly curved.

Operation. As it is usually found that subinvolution is present and kept up by the laceration, it is best to perform a preliminary curettage (see p. 70) before proceeding to the operation proper.

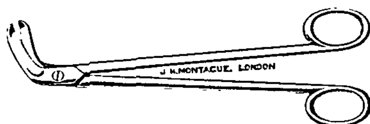


FIG. 38. EMMETT'S SCISSORS (LEFT) FOR TRACHELORRHAPHY.

The patient is placed in the lithotomy position and an Auvard's speculum is inserted. A piece of stout silver wire or a tenaculum is passed deeply through the anterior and posterior lips of the cervix; steady traction can be made through these and the uterus kept fixed while denudation and suturing are carried out. Should marked extroversion be present, with hypertrophy of the cervical glands, the curette should be freely applied to the diseased surface.

The uterine sound is passed to mark the situation of the internal os uteri, and an antero-posterior linear piece of lining membrane, about a quarter of an inch in breadth, must be allowed to remain untouched. This is necessary to prevent total occlusion of the cervical canal when the denuded flaps are sutured (Fig. 39)

Denudation The right half of the anterior and posterior lips of the cervix (upper and lower from the operator's point of view) are first pared by means of the angular knives and scissors, great care being taken to see that the deep angle of the reflexion is not overlooked. The other side is then treated in a similar manner. The tissues will be found extremely hard and resistant, especially if there be much cicatrization about the angle of the laceration

The passage of the sutures (Fig. 39). The short, stout, triangular-pointed needle is first doubly threaded with silk or stout chromicized catgut so that a loop of three to four inches in length is produced. The needle and the silk suture are passed as in Fig. 39, two on either side.

The triangular-pointed needle must be held in Schauta's specially strong holder (Fig. 47), and should be made to pierce the cervix near the raw surface on one lip, and pushed through the tissues immediately below this to emerge on the strip of unpared cervix already mentioned. It is then carried across the sulcus and is made to emerge through the opposite lip of the cervix. A stout wire is now hooked into the loop and pulled through the needle track. When the two wire sutures are inserted on either side, the flaps are brought together and the wires twisted together.

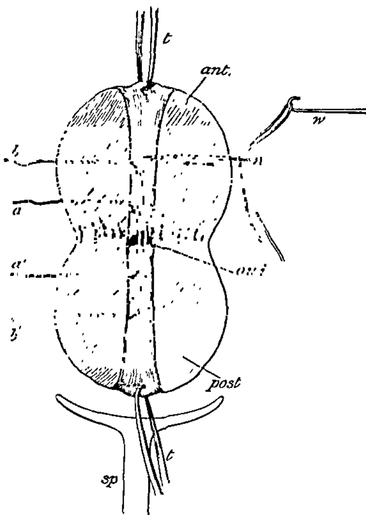


FIG. 39 TRACHELORRHAPHY. The patient is in the lithotomy position. The left half of the cervix has been denuded and two sutures, *a*, *a'* and *b*, *b'*, passed. The right half is intact, but the method of passing the needle *n* is indicated.

ant. Anterior lip of cervix. *o u.i.* Os uteri internum.
post. Posterior lip of cervix. *sp.* Speculum.
t,t Tenacula. *w* Wire.

Results. Primary union is the rule, and the wire sutures may be removed at the end of the tenth or twelfth day. The cervix has the appearance observed in the nullipara, and may lead to complications in any ensuing labour from difficulty of dilatation.

Dührssen modifies Emmett's operation by a flap-splitting procedure which, however, does not appear to possess sufficient advantages to warrant its general introduction.

VAGINAL FIXATION (Hysteropexy)

This operation consists in the fixation of the retroverted fundus uteri in an anteverted position, by suturing it to the anterior vaginal cul-de-sac.

Indications. These are somewhat uncertain, and the field of utility of the operation is rapidly becoming more limited. Advocates of this procedure recommend it for backward displacement of the uterus with or without adhesions. It is considered specially applicable to cases in which slight retroversion is complicated by moderate prolapse. The results which have so far obtained do not appear to be so good as those resulting from the use of a well-fitting pessary.

Operation. *The technique recommended by Dührssen appears to be* the most satisfactory, and is as follows: The patient is anæsthetized and placed in the dorsal position with the knees supported by a Clover's crutch. After purification of the parts (see p. 43) the cervix is pulled down as far as possible by means of a volsella: a curettage is then carried out as a preliminary measure (see p. 70). If cervical hypertrophy is present, amputation by Marckwald's method (see p. 76) should be performed, as an elongated cervix acts as a preventive to satisfactory anteversion of the uterus. A transverse or T-shaped incision is now *made as in vaginal hysterectomy (see p. 85), and the* cellular tissue pushed up by the index-finger until the peritoneum is reached. The peritoneum is now seized with a volsella and cut through, and the edges sutured to the lips of the vaginal wound. The uterine fundus is then anteverted by means of a sound: by pressing the handle of the instrument towards the perineum the fundus is brought into the wound. By means of a rectangular curved needle a stout silk suture is passed through the anterior wall of the fundus as high up as possible: the vaginal flaps are not included, as the suture is to be used for traction only. The uterus is now forcibly pulled down and two other sutures are introduced in the same manner higher up. Three sutures of catgut are passed through the uterine wall, including the vaginal and peritoneal flaps. The silk traction sutures are now withdrawn and the permanent ones tied. The vaginal wound is carefully sutured by means of fine silk.

Difficulties and dangers. The risks of the operation are peritonitis and wounding of one or both ureters or the bladder wall. Absolute rest for fourteen days is necessary and no local after-treatment is called for.

CHAPTER V

VAGINAL OPERATIONS FOR NEW GROWTHS OF THE UTERUS

Uterine growths include primary malignant disease and fibromyomata; the former should be treated by exploration and subsequent vaginal hysterectomy (see p. 83), while the latter should be dealt with according to their relations and attachments to the uterine wall.

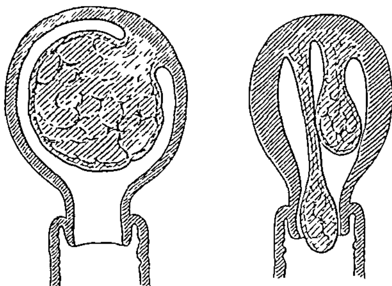


Fig. 40. Pedunculated Fibroid Polypi in various Stages of Extrusion
(*From drawings made at time of operation.*)

OPERATIONS FOR UTERINE FIBRO-MYOMATA

Fibro-myomata may present themselves to the operator in one of the following forms.—

1. As a fibroid polypus still intra-uterine or presenting through a naturally dilated and thinned-out cervix (submucous pedunculated).

2. As sessile growths presenting by their lower segments at the os uteri, which may be closed, or may be in varying degrees of dilatation (submucous sessile).

3. As tumours incorporated in the uterine wall (interstitial).

Operations for pedunculated tumours. *If a fibroid polypus be still intra-uterine* (Fig. 40) the proper treatment is to dilate the cervix

(see p. 72), and, if the pedicle be sufficiently thin, to seize the growth with a pair of stout polypus forceps and twist it off by a slow rotary movement of the handles. Should the pedicle be thicker than the finger, the use of the wire écraseur is advisable. This is a scientific snare, with a loop of pianoforte wire and a handle or wheel by which it can gradually be *tightened, causing the wire to cut slowly through the stalk of the growth* (Fig. 41).

The cervix is steadied with a volsella and the loop of the écraseur is shaped and bent to the size and position of the fibroid. The instrument is then passed into the uterine cavity and the noose pushed over the tumour up along the pedicle. The wire loop is then tightened up by means of the handle or wheel, and the wire cuts its way through and separates the growth from the uterine wall. It is somewhat dangerous to put any traction on the tumour before its separation, as is recommended

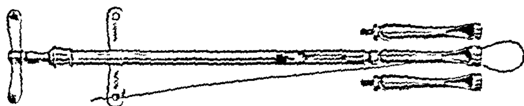


FIG. 41 WIRE ÉCRASEUR.

by some writers, as the uterine wall itself may become somewhat inverted and the wire loop may cut through into the peritoneal cavity.

If the fibroid polypus has passed through the external os uteri, treatment is more simple. Slight traction may be made upon it by means of forceps, and the pedicle severed with scissors; should too much traction be used, slight inversion of the uterine wall occurs and the wire of the écraseur may open up the peritoneal cavity. No hæmorrhage takes place, owing to the retraction of the stump.

Operations for sessile tumours. In submucous sessile fibroids (Fig. 42), in which the lower segment of the uterus is somewhat thinned-out and dilated, operative interference may be as follows: Preliminary dilatation of the cervix by bougies may be necessary. The capsule of the tumour is then incised with a sickle-shaped knife and the growth is enucleated by means of the finger or a blunt spoon. In some cases mere incision of the capsule is sufficient, and the uterus expels the growth later on.

Another method of treating these cases is by the operation of *morcellement*, which consists in removing the tumour piecemeal by means of specially made forceps.

The instrument used by the author consists of a strong pair of forceps somewhat like those used in lithotomy, with the two distal ends notched

with sharp teeth like a volsella. A portion of the tumour is seized between these two blades, and partly cut and partly twisted off. With patience and care the whole tumour may be thus removed. In one case the author was enabled to remove two large growths, each filling a pint measure. This operation is specially suitable in women in whom an abdominal operation is to be avoided.

Operations for interstitial tumours. Interstitial fibroid tumours, if not above the size of a small fœtal head, should be treated by vaginal hysterectomy (*vide infra*); if large, by hysterectomy by the abdominal route (see p. 105).

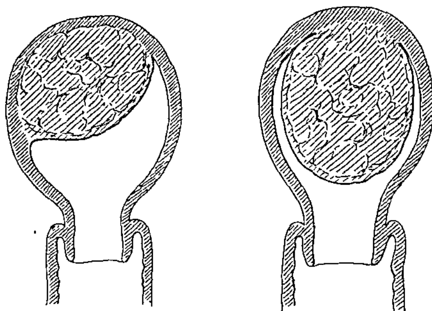


FIG. 42. SUBMUCOUS FIBRO-MYOMATA, CAPABLE OF TREATMENT BY MORCELLEMENT. (*From drawings made at time of operation.*)

Vaginal hysterectomy. By vaginal hysterectomy is meant removal of the whole uterus by the vagina, with or without the appendages. The advantages that the vaginal operation possesses over abdominal hysterectomy are, there is less disturbance of peritoneum and intestines, less shock, and no abdominal scar or risk of subsequent hernia. The operation is limited to uteri not exceeding in size the head of a full-time fœtus.

Indications. (i) Malignant disease of the uterus (fundus or cervix) in a very early stage: chorio-epithelioma malignum.

(ii) Certain cases of fibro-myoma of the uterus.

(iii) Certain cases of inflammatory disease of the uterine appendages complicated by recurrent attacks of local perimetritis.

(iv) Other conditions, such as intractable uterine hæmorrhage, usually due to uterine myo-fibrosis, and, as a last resort, severe dysmenorrhœa.

It has also been advised for irreducible chronic inversion of the uterus, and for severe procidentia uteri. No case of the former has occurred in the author's experience in which the operation was found necessary. In the latter condition the operation is not to be recommended, the almost certain result of the procedure being prolapse of the vaginal walls and the intestines (enterocele).

Vaginal hysterectomy for carcinoma. The only cases suitable for operation are early ones, in which the disease is still confined to the uterus itself, which should be freely mobile in all directions. No signs of infection of the surrounding cellular tissue and vaginal walls should be present. It cannot be too strongly insisted that all cases should be thoroughly examined under anæsthesia to settle this point before operation is decided upon. Rectal examination is most important to estimate the condition of the sacro-uterine ligaments, the cervix being pulled down so as to place them on the stretch.

Occasionally, cases of carcinoma of the cervix are seen, in which the cellular tissue immediately surrounding the cervix is apparently free from disease, but if search be made further outwards, a hard, fixed mass is found plastered, as it were, on to the side of the pelvis, indicating advanced disease of the lymph glands, or cellular tissue at the lateral part of the broad ligaments. Such cases are hopeless for operation.

If the disease is in the sloughing stage, and there is foul discharge, Paquelin's cautery should be applied to the diseased surface, followed by vaginal douches of formalin (ʒj to the pint), or some other efficient antiseptic, given three times a day for three days prior to operation. The operation consists of three main stages :—

(*a*) Separation of the cervix from the vagina, pushing up of the bladder and ureters, and opening the anterior and posterior peritoneal pouches.

(*b*) Removal of the uterus by ligaturing and dividing the broad ligaments.

(*c*) Treatment of the peritoneal and vaginal flaps thus left.

First of all, the growth, if of the cervix, should receive careful preliminary attention, for it constitutes a continuous source of infection, not only by means of septic organisms, but also of cancer cells, which may become implanted in the wound and cause early recurrence. The cervix is drawn down with a volsella and all visible growth is burnt away with the Paquelin cautery, until apparently healthy tissue only is left. The cervix is then completely closed by the application of a volsella or three or four stout silk sutures, passing through both anterior and posterior lips. The ends of the sutures may be left long if preferred and serve as tractors.

After these preliminary measures against infection have been com-

pleted, the removal of the uterus is proceeded with. A posterior speculum, Auvard's or Pozzi's, is passed, and the cervix is drawn downwards and somewhat backwards by traction on the volsellum or the long ends of the silk sutures. A sound is passed into the bladder to define its lower limit. A transverse or T-shaped incision (Fig. 22) is now made through the vagina at the level of the cervico-vaginal junction in front. This constitutes the anterior incision, and the transverse portion should extend completely across the anterior aspect of the cervix, passing through the whole thickness of the vagina, but no farther.

The knife is now laid aside, and the operator proceeds to push up the vagina and bladder from the anterior aspect of the cervix with the

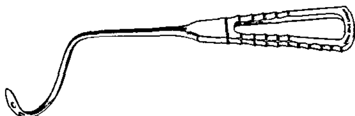


FIG. 43. GALABIN'S BROAD-LIGAMENT NEEDLE (RIGHT).

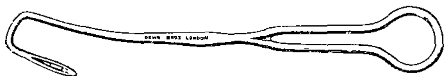


FIG. 44. JESSETT'S BROAD-LIGAMENT NEEDLE.

index-finger or a winged director, until the anterior peritoneal pouch is reached. This is at once recognized by its glistening white appearance and by the manner in which its opposing surfaces glide over one another.

This part of the operation must be conducted very cautiously for fear of injury to the bladder: the pulp of the finger only must be used in the separation. The frequent use of the bladder sound is very useful at this stage, as it is quite easy to wound this viscus laterally. Bleeding from the divided twigs of the vaginal vessels often obscures the field of operation and renders the separation of the bladder troublesome: it well repays the operator to stop all bleeding after making the vaginal incision.

The peritoneum is next picked up with fine forceps and opened with scissors. The anterior fold of peritoneum may sometimes be more easily reached after the bases of the broad ligaments have been ligatured and divided, thus allowing the uterus to be drawn down more readily, and making the peritoneum more accessible. An anterior retractor is then passed to keep the bladder out of the way.

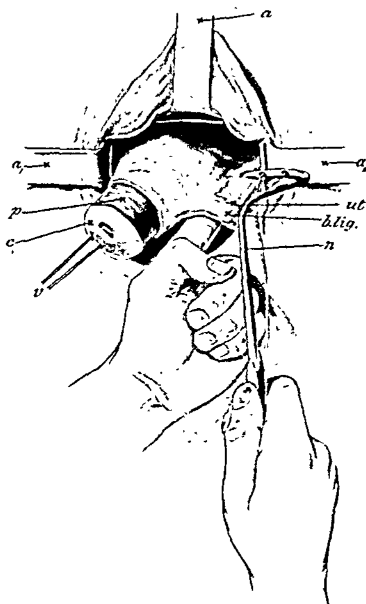


FIG. 45. VAGINAL HYSTERECTOMY. The patient is in the lithotomy position, the vaginal incisions have been made and the peritoneal cavity opened. The left broad ligament is exposed, and a Galabin's needle threaded with silk is being passed from before backwards on to the index-finger of the operator's left hand inserted into the peritoneal cavity. (*Semi-diagrammatic, from a photograph.*)

a a, a,,. Retractors. *b.lig.* Broad ligament.
c. Cervix. *n.* Galabin's needle.
p. Supravaginal cervix denuded of its coverings.
ut. Uterine artery. *v.* Volsella.

A second incision similar to the first is now made across the posterior aspect of the cervix at the level of the cervico-vaginal junction, more or less cellular tissue is traversed, and the posterior peritoneal pouch is opened. By joining the ends of these two incisions the cervix is completely separated from the vagina.

The uterus is now suspended in the pelvis by the attachments of the broad ligaments only; the next step consists in ligaturing and dividing these. The cervix is drawn over towards the patient's right side by an assistant, so as to expose the base of the left broad ligament. Additional space is gained by drawing aside the left wall of the vagina by means of a retractor. By passing the left index-finger behind the broad ligament the tube and ovary can be easily felt, and if necessary the bent finger can pull them down for inspection; the finger is then placed beside the cervix below and behind the base of the broad ligament. A Galabin's or Jessett's (Figs. 43, 44) needle, carrying a stout silk suture, is passed through the ligament from before backwards, on to the tip of the finger (Fig. 45).

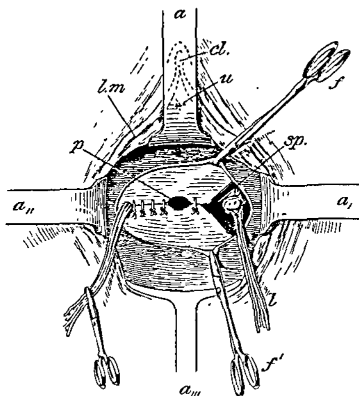


FIG. 46 VAGINAL HYSTERECTOMY. *Final stage.* The uterus has been removed, and the peritoneal flaps are in process of suture.

a a, a,, a,,,. Retractors. *cl.* Clitoris.

f, f'. Spencer Wells forceps attached to the anterior and posterior vaginal flaps. *l m.* Labium majus.

p. Circular orifice left open in the peritoneal flaps for insertion of gauze drain

sp Stump of left broad ligament with bundle of ligatures (*l*) *u*. Urethra.

The ligature should be passed about one-third of an inch up the broad ligament. It is then tied tightly and cut, or the ends left long, according to the views held by the operator. The segment of broad ligament included in the ligature is divided as near the uterus as is justifiable; in carcinoma of the cervix at least half an inch from the disease should be allowed. Care must be taken at this stage to avoid injury to the ureters;

these lie about one inch lateral to the cervix; consequently all ligatures must be passed as near the cervix as possible compatible with being clear of the disease.

A second ligature is now passed through the broad ligament above the first, and then a third, and more if necessary. The second generally includes the uterine artery, which can always be recognized by its strong pulsation under the finger; the third ligature will control the uterine tubes and ovarian arteries. After the arteries on the left side have been secured and divided, attention is directed to the right broad ligament. The cervix is drawn over to the left side, the fundus delivered, and the upper portion of the right broad ligament is dealt with in a similar manner, but from above downwards. If the ovaries and tubes are diseased, they can now be removed by piercing the pedicle and tying the stump in the usual way.

The uterus having been extirpated, the next step consists in dealing with the wound. First, all bleeding is stopped, and the wound is swabbed

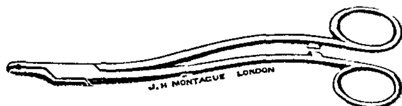


FIG 47 SCHAUTA'S NEEDLE-HOLDER.

clean and dry. The ligatures on either side may be tied in two bunches and the ends cut off just within the vagina (Fig. 46). A more strictly surgical proceeding is to cut each ligature off short and completely close the peritoneal cavity. The anterior and posterior flaps of peritoneum are united with a few catgut sutures passed by means of Schauta's needle-holder (Fig. 47); the walls of the vaginal vault are treated in a similar fashion, leaving a circular orifice in the median line into which gauze can be inserted for the purpose of drainage.

Some operators prefer to control the vessels in the broad ligaments by means of hæmostatic forceps instead of ligatures. Each broad ligament is clamped in three or more portions and the tissue between them and the uterus cut through. They must be allowed to remain in position for at least forty-eight hours, as recurrent hæmorrhage is possible if they are removed earlier. The only advantages of the forceps appear to be the rapidity with which the operation can be carried out, and the good drainage. The disadvantages are, that it is a somewhat unsurgical proceeding; there is often much pain from the nipping of the broad ligaments, and inconvenience from the presence of the handles between the labia; the intestines may be damaged; sloughing and risk of sepsis

must be reckoned with. Occasionally a constant venous oozing goes on in spite of carefully applied ligatures; this must be arrested by tightly packing the pelvic cavity with sterilized adrenalin gauze and removing it slowly at the end of thirty-six hours.

After-treatment. The catheter should be used at first four times daily; the author recommends that the gauze should be removed at the end of twenty-four hours, but some operators retain it longer. The ligatures should be pulled upon a little daily after the seventh day, and they gradually cut their way through the tissues in their grasp. No vaginal douching should be administered until after the expiration of a week.

Vaginal hysterectomy for fibroids. This is not often called for. The operation is necessarily limited to fibroid uteri not exceeding in size a fœtal head. Uterine fibroids of such a size can usually be treated in other ways, either temporarily by curetting, or, if submucous, permanently by enucleation through the vagina. The operation is most suitable for uteri containing many small fibroids causing severe hæmorrhage which cannot be controlled by more palliative measures.

The vagina must be large enough to admit of delivery of the uterus through its lumen. Therefore, in virgins and nulliparæ, the abdominal operation is always to be preferred. In any case, if the vagina be too narrow, additional room may be gained by lateral vaginal section (see p. 64) or episiotomy.

The operation does not differ in technique from the removal of the uterus for carcinoma, already described. In some cases it may be preferable to bisect the uterus in the sagittal plane before removing it, after the cervico-vaginal attachments have been separated and the peritoneal pouches opened.

SECTION IV

THE OPERATIONS UPON THE FEMALE BLADDER AND URETHRA

BY

C. A. LEEDHAM-GREEN, CH.M. (Birm.), F.R.C.S. (Eng.),
Surgeon, Queen's Hospital, Birmingham

CHAPTER I

CYSTOSCOPY: URETHROSCOPY: REMOVAL OF TUMOURS OF THE BLADDER AND URETHRA

Vesical growths occur decidedly less frequently in women than in men. According to Albarran's figures barely one-seventh of his cases were women.

Clinically the growths are conveniently classified into two groups, innocent and malignant.

CYSTOSCOPY

Every case of hæmaturia in a woman should be examined by means of the cystoscope. In this way alone can we hope to detect the presence of a growth affecting the urinary tract whilst still in an early stage. The importance of early recognition in the case of malignant tumours needs no emphasis.

As most vesical growths bleed very freely at the slightest touch, some little care must be taken when making the examination, otherwise nothing can be seen on account of the hæmorrhage. Happily we have now in adrenalin an excellent prophylactic remedy, which is conveniently used as follows: The urine is drawn off with a catheter, and then, prior to any irrigation, two ounces of novocaine solution ($\frac{1}{2}$ per cent.) with twelve drops of adrenalin are gently injected into the bladder. This injection is given a full twenty minutes before the cystoscopic examination is made, so that the adrenalin shall have sufficient time to act before the tumour is disturbed. When this time has elapsed, the bladder is very gently washed out with warm saline fluid, and the cystoscopic examination proceeded with. In this way all bleeding can generally be avoided, and there is no call for the use of a special irrigating cystoscope.

The examination should be made carefully and systematically, the whole of the cavity of the bladder being inspected, otherwise a small growth may easily be overlooked. It is not sufficient merely to note the presence of a tumour, but its size and exact situation should, as far as possible, be observed and recorded on a chart. By means of the cystoscope we can generally see these tumours, especially the small ones, far better than is possible when the bladder has been opened suprapubically.

Hence the value of noting accurately beforehand their number and situation.

Considerable caution should be exercised in attempting to decide the nature of the growth by its cystoscopic appearance. The infiltrating carcinoma can generally be recognized without difficulty, but to say whether a pedunculated growth is innocent or malignant is always hazardous. Nor, indeed, can this question of innocency or malignancy be decided with certainty by touch when the bladder has been opened suprapubically, or even by microscopic examination.

Neither surgeons nor pathologists are yet agreed as to the true nature of those seemingly innocent growths, which have a marked disposition to spread locally, to recur, and, at times, to assume a true malignant and destructive character.

URETHROSCOPY

Owing to the shortness and relatively simple anatomical structure of the urethra in the female, both cystoscopy and urethroscopy are very much more easily carried out than they are in the male.

The best instrument for examining the urethra is probably one in which the source of light is a minute incandescent lamp mounted on a rigid metal wire, which is passed down the urethroscopic tube so as directly to illuminate the portion of mucous membrane under observation. Some minutes prior to the examination the meatus and urethra should be anæsthetized by the injection of a little novocaine solution (2 %); on no account should cocaine be employed for this purpose, for, owing to the rapid absorption by the urethral mucous membrane, severe and even fatal toxic effects have been experienced. Then the urethroscopic tube, the end of which is closed with an obturator and lubricated with glycerine and tragacanth, is slowly passed down the urethra. The obturator is now withdrawn, the lamp is passed down the tube, and the light is switched on, when the mucous membrane can be examined little by little as the tube is gradually withdrawn. All secretion, blood, or urine must be carefully mopped up, each portion of the membrane being cleaned and inspected as it comes into view. For cleaning purposes it is convenient to use thin wooden strips, having a little cotton-wool wrapped round one end.

In the normal condition, except during micturition, the walls of the urethra are in contact, lying in longitudinal folds. The passing of the urethroscope separates the walls, but as it is being withdrawn they fall together again, at a short distance from the end of the tube, in the form of a funnel, the folds radiating from a central point, which has much the appearance of a sphincter, and is called ‘ the central figure ’.

It must be remembered that the normal mucous membrane varies greatly in colour according to its vascularity and other circumstances, so that too much importance must not be attached to a slight alteration in its tint. Indeed, considerable experience is necessary in order rightly to interpret the urethroscopic picture. The instrument is chiefly useful in the detection of obscure chronic inflammatory lesions—gonorrhœa, soft sore, primary syphilis. The routine employment of the urethroscope in the diagnosis of urinary diseases is neither necessary nor desirable.

REMOVAL OF BLADDER TUMOURS

Save in those cases where all operative interference is contra-indicated on account of some constitutional disease, there is little doubt that the sooner vesical growths are removed the better. As long as they are present they are a source of danger to the patient: firstly, from the deleterious constitutional effects consequent on the frequent loss of blood; secondly, from the fact that infection of the bladder, with all its potential dangers, is rarely long absent; and lastly, from risk of the growth becoming malignant.

Leaving on one side the treatment by high frequency, or other electrical means, as to the value of which, at the time of writing, we are too inexperienced to give an opinion, tumours of the bladder in the female may be removed in four ways:

1. Through the artificially dilated urethra.
2. By an incision through the anterior vaginal wall (colpocystotomy).
3. By snare or cautery with the operating cystoscope.
4. By a suprapubic cystotomy.

The first method, viz. the rapid digital dilatation of the urethra and the removal of the tumour by forceps guided by the sense of touch, is now obsolete. It is dangerous and unsatisfactory from every point of view.

The same may be said of colpocystotomy, for it is impossible by an opening through the vaginal wall to obtain such a clear view of the whole of the interior of the bladder as is necessary for the removal of the growth and the exact arrest of the bleeding.

Removal by means of the cystoscopic snare. As regards the respective merits of operating by means of the cystoscopic snare and a suprapubic incision, there is far from unanimity of opinion amongst urologists. All are agreed that the snare is quite unsuitable for dealing with malignant tumours of any kind. Anything short of a radical excision in such a case is worse than useless. Further, even the most

ardent advocate of the operating cystoscope admits that many of the innocent tumours, from their form, size, situation, &c., can only be satisfactorily removed by the knife. The real point at issue is whether a medium-sized pedunculated villous growth, springing from the trigonum or other accessible situation, is better removed by the cystoscopic snare or by a suprapubic incision. There is a good deal to be said on both sides, and at present we have perhaps hardly sufficient data to dogmatize on the matter.

A few years ago the operating cystoscope was a very cumbersome instrument, which none but an expert could hope to use efficiently, but, thanks to many optical and mechanical improvements, there are now several instruments on the market which are quite simple to use—that is, simple for any one practised in cystoscopic work. With one of these it is not difficult in a favourable case to slip the loop of the snare (which may be either a simple steel wire or a platinum cautery loop) over the villous growth and cut through the pedicle, close to the bladder-wall. One of the chief difficulties in doing this arises from the fact that these growths bleed profusely when touched, be it ever so lightly, with the cystoscope or snare, and the blood quickly obscures the view. If, however, a preliminary injection of adrenalin be given, as already advised, this difficulty can usually be avoided. The operation in women is not painful, and can be done better under local (novocaine) than general anæsthesia. Amongst the advantages claimed for this method of operating are:

(1) The avoidance of a major operation, with its attendant risks and necessarily long convalescence.

(2) Although a recurrence may occur after either operation, the intravesical method is less frequently followed by a widespread dissemination of the growth in the bladder (general papillomatosis); any recurrence that takes place is more local and more easily treated.

(3) When a recurrence takes place, there is no obstacle to repeating the procedure again and again; whereas, should it occur after cystotomy, a second operation is very likely to be followed by a troublesome fistula or ventral hernia.

Against these advantages the following objections are raised:

(1) It is impossible always to tell beforehand whether a villous growth is malignant or not, and consequently all ought to be excised.

(2) Recurrence is more frequent than after extirpation by the knife. This is a doubtful point and many hold the opposite view.

(3) There is a greater risk of dangerous hæmorrhage following removal of the growth. This, again, is doubtful; in several hundred cystoscopic operations Casper records that on only four occasions did he see serious

bleeding—twice immediately following the removal of the tumour, twice some days later.

The author's experience with the intravesical operation (removal of the growth with the cold snare, followed by cauterization of the stump, either immediately or a few days later) has been uniformly satisfactory, both as regards the immediate and late results, and he believes it to be the method of choice for suitable cases.

Any attempt, however, to use it as a routine treatment for all villous growths can only lead to disaster.

Removal by suprapubic cystotomy. Removal of the growth by the suprapubic route has the advantage both of being suitable for all cases which admit of operation, and of not calling for any special manipulative dexterity on the part of the surgeon. It is, of course, a more serious operation than the other, and, where large tumours are concerned, has a rather high mortality. Published statistics on this point are apt to be very misleading. The removal of a small, uncomplicated, pedunculated papilloma is hardly more serious than a simple cystotomy; whereas the extirpation of a growth involving resection of the bladder wall and transplantation of the ureters is one of the most formidable of surgical procedures.

The chief immediate danger is hæmorrhage, both during and after the operation. These growths are exceedingly vascular, and, unless care be taken, the patient may lose a serious amount of blood. It is therefore advisable to give an injection of dilute adrenalin solution into the bladder before the patient is anæsthetized. By this means, not only is the loss of blood avoided, but the execution of the operation is greatly facilitated. Half an hour after the adrenalin injection, the bladder should be emptied with a catheter and thoroughly washed out with oxycyanide of mercury solution (1 in 5,000). The patient is then anæsthetized and placed in the Trendelenburg position. After the bladder has been well distended, a transverse incision is made suprapubically through the integuments. If an extensive resection of the bladder is contemplated, the rectus muscle must be divided across; for a small growth this is not necessary. A transverse incision through the bladder wall gives better access and is more easily sutured than the usual longitudinal one. During the operation it is held open by silk sutures or retractors, as is most convenient. In the case of a villous tumour the growth should be gently raised by the finger and, with the least disturbance possible, the pedicle clamped by a pair of light curved forceps. The tumour can then be cut away, leaving the forceps on the pedicle.

The removal of the growth in this way enables the surgeon to see exactly where the pedicle springs from, and so to determine the best

way of dealing with it. In the case of a slender stalk, all that is necessary is to transfix and tie its base with a fine catgut suture. If the pedicle is broad and fleshy, the mucous membrane should be incised round it and the growth extirpated with the knife, the vessels being ligatured before being divided. After the tumour has been thus removed, the edges of the mucous membrane are brought together with a fine catgut suture.

Small sessile vascular growths may be simply destroyed with the cautery point, which may also be used to arrest bleeding from a divided vessel which cannot be picked up ; though, as a rule, it is better in such cases to secure the vessel by a fine catgut stitch.

Great care must be taken, when dealing with growths springing from the trigonum, that the ureters are not cut or ligatured. Should a ureter be involved in the growth that has to be resected, the end of the shortened duct must be fixed with a few catgut sutures in the upper part of the bladder wound. When removal of the growth is complete, the bladder should be washed out again with the oxycyanide of mercury solution, with a view not only of cleansing it but also of destroying any epithelial cells detached from the growth, and so diminishing the risk of recurrence through cellular implantation at the time of the operation.

If all bleeding has been arrested and there is no cystitis, the suprapubic wound may be completely closed—the bladder with Lembert catgut sutures, the integument with silk. When this has been done the bladder may be drained, by a Skene's glass self-retaining catheter. Three or four times a day the bladder should be gently washed out with a little warm solution of protargol (1 in 1,000) or oxycyanide of mercury (1 in 5,000). For the first day or two, small doses of morphine or heroin should be given for the relief of the bladder tenesmus.

About the sixth or seventh day the self-retaining catheter may be removed, the urine being drawn off by the passage of a simple catheter, every three hours, for the next few days. Throughout the convalescence a urinary antiseptic, such as urotropin, should be given by mouth.

Infiltrating malignant growths of the bladder are only rarely seen by the surgeon at a time when operative interference has a chance of effectually grappling with the disease, and as a rule are better left alone. Even when the patient survives the formidable and mutilating operation which the extirpation of these growths requires, her condition is generally pitiable, and recurrence of the disease practically invariably takes place quickly. It is only when the carcinoma is limited to the anterior and upper walls of the bladder that an operation holds out any chance of success.

It is difficult at the present time to estimate the frequency with which

recurrence takes place after the removal of a vesical growth by the suprapubic route. Rafin (*French Urological Congress*, 1905) reported on 91 such operations with a 73·6 per cent. cure. Zuckerkandl (1909) stated that he had operated during the last six and a half years upon fifty papillomatous tumours of the bladder by the suprapubic route. Of these, thirty-six (i.e. 72 per cent.) were so far free from recurrence, four of the patients died from the effects, and in ten recurrence took place. Of these last, eight were operated upon again and all were found to be malignant, only one of which was definitely cured.

REMOVAL OF TUMOURS OF THE URETHRA

By far the most common new formation affecting the urethra is the so-called vascular caruncle, a term which is applied somewhat loosely to a small bright-red vascular growth of an innocent nature which frequently develops at the posterior margin of the urethral orifice of women. Apart from vascular caruncle, innocent growths of the urethra are too rare to call for comment here.

Both carcinoma and sarcoma frequently attack the urethra, but generally do so secondarily, having their origin either in the bladder or peri-urethral tissue. Consequently they are rarely suitable for radical operative treatment.

The simplest and most effective method of dealing with these innocent growths is to destroy them with a fine-pointed electric cautery. But it must be remembered that when dealing with the granuloma form of caruncle the urethritis must also be treated.

Should a malignant growth of the urethra be detected whilst still in a relatively early stage, it should be boldly excised and the inguinal lymphatic glands dissected out. If the growth be limited to the urinary meatus, the excision of the tumour will offer no special difficulties. Should the growth be more extensive, then its removal may necessitate the sacrifice of the greater part of the urethra and consequent loss of control of the bladder.

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CHAPTER II

REMOVAL OF CALCULI AND FOREIGN BODIES FROM THE BLADDER: OPERATIONS FOR PROLAPSE OF THE URETHRA

VESICAL stone is comparatively rare in women. Owing to the shape of the bladder and the wide, short urethra, small calculi, which have come down from the kidney, are quickly got rid of without difficulty. Foreign bodies, on the contrary, are far more commonly met with than in the male. If the presence of a stone or foreign body is suspected, a cystoscopic examination should be made without delay (see p. 93). Should a stone be seen in the bladder, it is always advisable to have a radiograph of the kidneys and ureters taken, so that the presence or absence of further calculi in the urinary tract may be ascertained—a point of no little importance both as regards prognosis and treatment.

There is still much difference of opinion as to the best method of removing a stone from the female bladder.

There is a choice of four ways, viz.:

1. Per urethram, after artificial dilatation.
2. By lithotrity.
3. By suprapubic cystotomy.
4. By colpocystotomy.

The first of these should not be employed. It is liable to cause serious damage to the bladder sphincter, and has repeatedly been followed by permanent incontinence of urine.

Any of the other three methods may be employed, and the surgeon will be wise to select the one with which he is most familiar. If he is experienced in lithotrity, there is no doubt that this is the ideal method. The patient is exposed to the least risk, and the convalescence is a matter of a few days, not weeks as in the cystotomy operations.

It is often said that lithotrity is difficult to perform in the female, on account of the shortness of the urethra and absence of the prostate. This is not the author's experience, and it is certainly for these very reasons done with much less bruising of the tissues than in the male. After the operation is completed, the cystoscope should be introduced to make certain that every fragment of stone has been removed.

VAGINAL LITHOTOMY (COLPOCYSTOTOMY

There is not very much to choose between opening the bladder from the vagina, or suprapubically. The gynæcologist will probably prefer the former, the surgeon the latter. In young girls the vaginal route is unsuitable; otherwise I think it is, on the whole, the better of the two ways, being a smaller operation and less dangerous. It is carried out as follows: After the bladder has been well washed out with, say, oxycyanide of mercury solution (1 in 5,000), it is gently distended and the patient placed in the lithotomy position with the pelvis well raised. A Sims's speculum is inserted, then an incision, from 1½ to 2 inches long, is made exactly in the median line along the anterior vaginal wall. This should begin near the cervix uteri and not approach too near the sphincter of the bladder. The incision should divide the vaginal wall and expose the bladder. A metal sound is then passed up the urethra, the point turned downwards, and a pouch of the bladder pressed through the vaginal incision. The bladder wall is seized with two pairs of fine-toothed forceps and incised. The stone is brought out by the finger or forceps and, in the absence of severe cystitis, the wound stitched. This is best done in two layers; first the bladder is closed with a fine catgut Lembert suture, then the vaginal wall is stitched with silk. The after-treatment, as regards catheterization, is the same as that for vesical fistula. The surgeon need have no fear of the wound failing to close and so giving rise to trouble.

It is unnecessary to describe the suprapubic operation as it does not differ from that in the male (see Vol. III).

As regards the extraction of foreign bodies, these can, as a rule, be best removed per urethram by means of a pair of forceps or blunt hook passed by the side of a cystoscope. Then, guided by the eye, the foreign body can be seized and removed without inflicting damage to the bladder or urethra. In removing a hair-pin, it must be manipulated so as to get the loop towards the urethra, which is then laid hold of with a hook.

OPERATION FOR PROLAPSE OF THE URETHRA

The prolapse generally involves the whole circumference of the urethra, but may affect only a small segment. In the acute cases a cure may sometimes be effected by simply reducing the prolapse and keeping the patient in bed for a few days, but as a rule some operative procedure is called for.

If the prolapse is but small it may be treated by the application of a very fine electric cautery, the prolapsed mucous membrane being burnt

CHAPTER II

REMOVAL OF CALCULI AND FOREIGN BODIES FROM THE BLADDER: OPERATIONS FOR PROLAPSE OF THE URETHRA

VESICAL stone is comparatively rare in women. Owing to the shape of the bladder and the wide, short urethra, small calculi, which have come down from the kidney, are quickly got rid of without difficulty. Foreign bodies, on the contrary, are far more commonly met with than in the male. If the presence of a stone or foreign body is suspected, a cystoscopic examination should be made without delay (see p. 93). Should a stone be seen in the bladder, it is always advisable to have a radiograph of the kidneys and ureters taken, so that the presence or absence of further calculi in the urinary tract may be ascertained—a point of no little importance both as regards prognosis and treatment.

There is still much difference of opinion as to the best method of removing a stone from the female bladder.

There is a choice of four ways, viz.:

1. Per urethram, after artificial dilatation.
2. By lithotrity.
3. By suprapubic cystotomy.
4. By colpocystotomy.

The first of these should not be employed. It is liable to cause serious damage to the bladder sphincter, and has repeatedly been followed by permanent incontinence of urine.

Any of the other three methods may be employed, and the surgeon will be wise to select the one with which he is most familiar. If he is experienced in lithotrity, there is no doubt that this is the ideal method. The patient is exposed to the least risk, and the convalescence is a matter of a few days, not weeks as in the cystotomy operations.

It is often said that lithotrity is difficult to perform in the female, on account of the shortness of the urethra and absence of the prostate. This is not the author's experience, and it is certainly for these very reasons done with much less bruising of the tissues than in the male. After the operation is completed, the cystoscope should be introduced to make certain that every fragment of stone has been removed.

SECTION V

OPERATIONS FOR NON-MALIGNANT AFFECTIONS OF THE UTERUS

BY

SIR JOHN BLAND-SUTTON, F.R.C.S. (Eng.)

Surgeon to the Middlesex Hospital

in three or four places in the long axis of the urethra, in the hope that the subsequent contraction of the linear scars will reduce the prolapse and prevent its recurrence. An old and thoroughly effective method is to insert a metal catheter and then tie a piece of fine silk tightly round the base of the prolapse, so as to strangle it. In a few days the mucous membrane shrivels up and drops off, and the condition is healed. Instead of ligaturing it in this manner, the prolapse can be excised and the edges of the divided mucous membrane sutured with fine silk.

CHAPTER I

HYSTERECTOMY

Hysterectomy is the name applied to the surgical operation for the removal of the uterus.

Indications. Hysterectomy is mainly required in the radical treatment of fibroids and malignant disease (carcinoma, sarcoma, and chorion-epithelioma; in this connexion the reader is referred to pp. 149). It is occasionally required for injury, and certain morbid states due to acute and chronic sepsis; and for a condition but little understood, termed fibrosis. Hysterectomy is also carried out for such conditions as adenomyoma of the uterus, hæmatometra, tuberculous endometritis, and on rare occasions for chronic inversion of the uterus and inveterate dysmenorrhœa.

The presence of fibroids in the uterus is a common cause for which hysterectomy is required, and the history of this operation is full of interest.

The uterus may be removed by two methods. In one, access is obtained to the uterus through an incision in the belly-wall; this is termed abdominal hysterectomy. In the other, the whole uterus is extirpated through the vagina, and on this account it is termed vaginal hysterectomy or colpo-hysterectomy.

The abdominal method of removing the uterus may be performed in two ways:

In one the body of the uterus and a portion of its neck is removed; this is called subtotal hysterectomy. In the other the body of the uterus and the whole of its neck are excised: this is total hysterectomy (or panhysterectomy). The ovaries and uterine tubes may, or may not, be removed, according to the disease for which the operation is undertaken. This is a matter which will receive ample consideration later on (see p. 144).

For the satisfactory performance of abdominal hysterectomy the Trendelenburg position is necessary.

SUBTOTAL HYSTERECTOMY

The abdomen is opened by the median sub-umbilical incision; but when the operation is performed for the removal of large tumours it will frequently require extension above the umbilicus. The operator should never allow himself to be embarrassed by a small incision. As

with the inferior epigastric artery. If the surgeon thoroughly appreciates the distribution of the ovarian and uterine vessels he will at once perceive that if the four forceps are properly applied to the vessels the blood-supply is under absolute control; indeed, in many cases a subtotal hysterectomy can be performed without the loss of more than an ounce of blood. When the broad ligament is clamped and detached there is a spurt of blood from the uterine cornu which lasts until the corresponding uterine artery is caught with the forceps, and the cessation of the bleeding at the uterine cornu is a sign that the artery is securely clipped. It must be remembered that with a small tumour in the uterus the vessels follow their normal courses and can be easily found, but when the uterus is deformed by huge tumours, the vessels are not so easily seen, and they are of large size and give rise to furious bleeding when divided. In dealing with large and vascular uterine fibroids another factor has to be reckoned with, namely, the enormous veins in the pampiniform plexus, interspersed with lymph-vessels which in some cases are as thick as the index finger; it is not an uncommon thing to meet with lymph-vessels in this situation a centimetre in diameter and filled with straw-coloured lymph.



FIG 49 THE MATTRESS SUTURE. A diagram to show the method of applying it.

The surgeon now secures the vessels. The ovarian pedicles are transfixed and ligatured with silk as in ovariotomy; the round ligament is usually included in the ovarian pedicle. It occasionally happens that a fibroid situated near the uterine cornu will grow in such a manner that it widely separates the ovarian ligament, the uterine tube, and the round ligament from each other. In such a condition it is impossible to save the ovary without risk, and also inadvisable to attempt the inclusion of the round ligament in the pedicle containing the ovarian vessels. In these circumstances the round ligament is easily secured by a mattress suture, which should include both layers of the corresponding broad ligament.

When the surgeon decides to leave an ovary and the corresponding uterine tube, these structures are carefully examined to determine if they are healthy and free from any suspicious fluid. *When the endometrium is septic or cancerous both ovaries and tubes should be removed.* When the surgeon decides to leave an ovary and its corresponding uterine tube, he should take care in securing the ligatures to include the ligament of the ovary: it is very liable to slip out of the encircling loop of silk. It is often

soon as the peritoneal cavity is reached, the surgeon introduces his hand and carefully makes out the nature of the case, the presence or otherwise of adhesions, other tumours, and the relation of the fibroid to the uterus, and determines whether it is impacted in the pelvis. The uterus is then carefully lifted out through the incision, or drawn out with the assistance of a volsella; the intestines and omentum are isolated from the pelvis with a large warm dab.

In a simple case the broad ligaments are seized with hæmostatic forceps; if the ovaries and tubes are healthy and the surgeon wishes to preserve them, the forceps are applied between the ovary and the uterus; but if they are obviously diseased and must be sacrificed, the forceps are applied to the broad ligaments near the brim of the pelvis beyond the outer pole of the ovary. It is an advantage to secure with forceps the round ligament at this stage, in order to control bleeding from its artery and prevent the stump of the ligament unduly retracting the peritoneum. The broad ligament on each side is divided, and each uterine artery is exposed at the sides of the uterus near the cervix, and caught with forceps: a peritoneal flap is then fashioned on the anterior wall of the uterus at its junction with the neck, taking care not to injure the bladder; and a similar flap is cut on the posterior wall. The uterus is then detached at a point well below the junction of the cervix with the body of the uterus: if the forceps are correctly applied to the vessels the detachment of the uterus is an almost bloodless proceeding: a small vessel here and there will perhaps require the application of a pair of forceps.

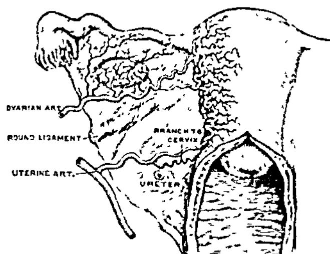


FIG. 48. A DIAGRAM TO SHOW THE ARTERIAL SUPPLY OF THE UTERUS.

The principle involved in this part of the operation may be explained by reference to the diagram (Fig. 48). The blood-supply of the uterus follows four routes; two of these are the ovarian arteries which traverse the broad ligaments to reach the cornua of the uterus, where they anastomose with the terminations of the uterine arteries; the latter come into relation with the uterus near the junction of the body and cervix, and then ascend the sides of the uterus to the cornua. No large vessels are found on the anterior or posterior surface of the uterus. An arterial twig runs along the round ligament, bringing the ovarian artery into relation

projecting stump on the floor of the pelvis; the sutured edges of the peritoneum merely appear as a thin line below the base of the bladder.

The pelvis is now cleared of blood and clot; the dabs and instruments are counted, and it is also useful to examine the condition of the vermiform process, and if grossly diseased it should be removed.

The abdominal incision is then sutured in the usual way.

TOTAL HYSTERECTOMY

This operation differs from the preceding in the fact that the neck of the uterus is removed as well as its body. The abdomen is opened in the usual way and the uterus is withdrawn from the abdomen and the arteries controlled by forceps, and the broad ligaments divided exactly as in the case of the subtotal operation. Unless the uterus be very big, it is drawn well out of the abdomen and the bladder peeled off its anterior aspect. The surgeon then feels for the extremity of the cervix and opens the vagina with the scalpel and carefully detaches it from the neck of the uterus, taking great care to keep close to the cervix in order to avoid wounding the bladder or the ureters. As soon as the uterus is detached, the cut edge of the vagina is seized with the volsella to prevent it retracting. In some instances the body of the uterus may be removed as in the subtotal operation, and the cervix detached separately; occasionally the surgeon begins his operation with the intention of performing the subtotal operation, but finds the cervix unhealthy or cancerous, and removes it.

As soon as the uterus is removed and all bleeding under control, then the blood-vessels are secured with ligatures; the ovarian artery and vein are secured on each side in the usual manner. The chief point in this operation is the method of dealing with the vaginal opening. In the subtotal operation the vessels concerned in the stump are the uterine arteries, but in the total operation the territory of the vaginal arteries is invaded, and these vessels are apt to bleed when the patient is returned to bed, unless care is taken to secure them in the course of the operation. The parts which require most attention are the lateral angles in the immediate neighbourhood of the uterine arteries; these angles may be secured by a mattress suture involving the anterior and posterior walls of the vagina; any oozing on the anterior or posterior wall is commanded by a mattress suture involving these walls separately, so as not to completely close the vaginal opening. Bleeding from the cut edges of the vagina may also be readily controlled by means of a continuous suture of thin silk. The peritoneum is sutured over the cut ends of the vagina, so that when the operation is completed a thin seam is seen lying under the base of the bladder.

In cases where the uterus is removed for septic conditions, such, for

convenient to include the round ligament of the uterus in the pedicle, but it is not a disadvantage when it is tied separately. As a rule, the cervical canal is free from micro-organisms, especially in spinsters, but they are present with sufficient frequency to make an application of tincture of iodine to the cervical endometrium and the cut surface of the stump a judicious act before applying the ligatures. It is important also to wash the gloved hands in a solution of perchloride of mercury (1 in 5,000) before applying the sutures.

The uterine arteries are ligatured with thin silk; these vessels as they run up the sides of the uterus are accompanied by veins, so that there is a vascular tract at the point where the cervix is divided. If after the uterine vessels are secured there is oozing from these veins, it is easily controlled by a mattress suture. This kind of suture is so useful that the mode of inserting it may be given in more detail. *In the diagram* (Fig. 49) the silk is represented in position before it is tied, and in that particular instance it is represented as being passed through the peritoneal flaps from before backwards, and this is usually the most convenient route; occasionally the reverse direction is easier. It will be noticed in the diagram that this suture not only controls oozing from the tissue in the immediate neighbourhood of the uterine vessels, but it also embraces the main vessels, and thus serves as an additional security against hæmorrhage; it also brings the peritoneal flaps into apposition.

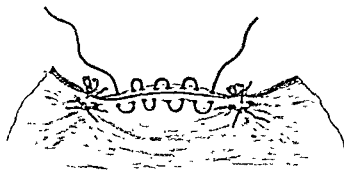


FIG. 50 THE STUMP AFTER SUBTOTAL HYSTERECTOMY. To show the method of applying the continuous suture.

As soon as the oozing of blood has been controlled, the cervical canal is examined to ascertain if it be free from polypi or cancer. Should the condition of the cervix be in the least degree suspicious of cancer it must be extirpated. When it is healthy, then the flaps are brought together by one or two interrupted sutures, and the edges more carefully approximated by a continuous suture of thin silk. In suturing the flaps it is necessary to avoid puncturing the bladder, which is quite close to, and often forms part of, the anterior flap. Care must also be taken in passing the needle (especially when it has sharp edges) in the neighbourhood of the stumps of the uterine arteries, or they will be pricked, and then free bleeding will cause delay in the operation.

When this operation is properly performed, there should be no

much inflammatory trouble in the pelvis the peritoneum lining it is often thick and œdematous. Under such conditions, additional care is necessary in exposing the hypogastric arteries, as the ureters are then not so easily recognized, and therefore run a greater risk of being cut during the exposure of the artery.

After the hypogastric arteries are tied the uterus is completely extirpated. Sometimes there is no bleeding from the uterine arteries when they are cut in the course of the operation; in others a thin jet of blood escapes. In either case they should be ligatured.

This method has no advantage over the ordinary operation of total hysterectomy for fibroids. It is useful when the uterus is removed for septic conditions because the ligatures applied to the cut edges of the vagina act as setons until they are extruded into the vagina.

Drainage. When the uterus has been removed for fibroids associated with inflamed and adherent ovaries, or uterine tubes distended with pus, and oozing surfaces exist in the pelvis, it is a wise precaution to drain. This is especially necessary in cases where fibroids of the uterus are complicated with cancer of the cervix. Cancer in this part of the uterus is colonized with micro-organisms.

After trying many methods I find the following useful:—

A rubber tube reaching to the bottom of the pelvis and emerging at the lower angle of the abdominal incision. It is rarely required more than forty-eight hours. Drainage judiciously employed is useful, and a tube inserted in the manner described acts better than one introduced through the vagina, and it is more easily managed; if retained too long the scar may be weak at the site of the drain tract, and is more liable to yield.

IMPACTION OF FIBROIDS

In the majority of cases an abdominal hysterectomy is a straightforward operation, but there are conditions which render the operation tedious or difficult and from these reasons are worth consideration. A common difficulty is impaction of the uterus in the pelvis. A fibroid is said to be impacted when it fits the true pelvis so tightly that the tumour cannot rise into the abdomen. At times the impaction is so complete that the surgeon finds difficulty in withdrawing the tumour even after the parts are exposed through an incision in the abdomen: in such an event he incises the capsule and enucleates the fibroid. This relieves the impaction and allows the uterus to be freely withdrawn from the pelvis.

A common form of impaction occurs when a fibroid grows in the anterior and one in the posterior wall of the uterus. These are known as twin-fibroids (Fig. 51). So long as the antero-posterior diameter of the uterus does not exceed 10 cm it may occupy its normal position. When

example, as an infected or gangrenous fibroid, or when cancer of the corporeal endometrium and a submucous fibroid coexist, I modify the last stages of the operation. After the ovarian and uterine arteries are ligatured, the cut edges of the vagina are secured in the following way: the cut edge of the peritoneum covering the bladder is stitched to the cut edge of the anterior wall of the vagina, and in the same way the peritoneum in relation with the posterior vaginal wall is stitched to the corresponding cut edge of the vagina. The flaps at the lateral angles of the vaginal opening are drawn together with a suture and the intervening segment is left with merely the cut edges in apposition; this affords a route for the escape of inflammatory exudation.

Whether the peritoneum is sutured over the vaginal opening, or whether the edges are merely left in apposition, the recesses of the pelvis are thoroughly cleared of fluid and clot. The dabs and instruments are counted, and the abdominal wound sutured in the usual way. In septic conditions the abdominal incision should be closed with a single row of through-and-through sutures. Before the patient leaves the operating table it is useful to examine the vagina and mop out any blood which has found its way there in the course of the operation. It is also useful to pass a glass catheter and withdraw any urine that has accumulated *during the operation.*

If there is evidence of free oozing it is most likely to come from the cut edges of the vaginal wall in a case of total hysterectomy: under such conditions it is easy to apply a pair of fenestrated forceps to the oozing area and leave them on for thirty-six hours. They will cause the patient trifling inconvenience. Care must be taken not to fix the blade too far on the anterior flap or it will lead to subsequent sloughing of the bladder.

When there is free oozing of blood from the cervical canal after subtotal hysterectomy, it is easily and safely controlled by applying a pair of fenestrated forceps on each side of the cervix, but not too deeply, or the ureters may be nipped. These should be left on for thirty-six hours.

TOTAL HYSTERECTOMY WITH PRELIMINARY LIGATURE OF THE HYPOGASTRIC ARTERIES

With the hope of abolishing the trouble caused by the ligatures applied to the cut edges of the vagina becoming septic I have tried the effect of tying the hypogastric arteries. This is easily carried out. After the abdomen is opened, the peritoneum is incised where it lies over the brim of the pelvis at the sacro-iliac synchondrosis.

On the right side, care must be taken not to injure the ureter which lies in close relationship to the artery. On the left side, in addition to the ureter, the rectum complicates the proceeding. It is necessary to incise the mesorectum and turn the bowel laterally. When there has been

A large, solitary intramural fibroid in the fundus of the uterus (Fig. 52) sometimes become impacted and leads to a curious error in the course of hysterectomy. Such a fibroid is usually globular. When it has a diameter of six inches or more, it will fill the pelvis and push the uterus downwards in a way that hinders the surgeon reaching the cervix, and he is sometimes astonished to find (on examining the parts after completing the operation) that he has amputated the uterus through the middle of its body instead of dividing the neck. I have seen this happen on several occasions. Patients under forty-five years of age, in whom this occurs, will menstruate after the operation if an ovary has been conserved.

Axial Rotation. This is a rare complication of fibroids, so rare that in more than two thousand operations for fibroids I have only seen three with a twisted pedicle.

One was a subserous fibroid the size of a tennis-ball; it had a thick stalk and a coil of ileum became entangled in the twist, producing symptoms of acute intestinal obstruction, which were relieved by operation. The patient recovered.

The second was a calcified subserous fibroid in a patient aged fifty-three. The uterus contained two large and twenty small fibroids, one of them, as big as a fist, had twisted its pedicle, producing sudden violent pain, frequent micturition, and tenesmus. Temperature 102° Fahr., and pulse-rate 120 per minute. Subtotal hysterectomy was successfully performed. The tumour, with its stalk twisted, is preserved in the Museum of the Royal College of Surgeons, England.

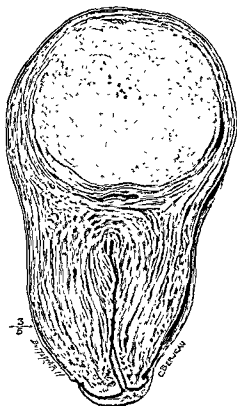


FIG. 52. UTERUS IN SAGITTAL SECTION. A globular intramural fibroid occupies the fundus From a nulliparous woman aged 45.

These are examples of twisted pedicles such as we are familiar with in the case of ovarian cysts and tumours, but when a large sessile fibroid rotates the uterus serves as a pedicle, and a long supravaginal cervix predisposes to this abnormal movement. In some specimens, the neck of the uterus has been tightly twisted and reduced to the dimensions of a quill at the point of greatest torsion. We must distinguish between torsion of the pedicle of a fibroid and torsion of the uterus. The following is a good example of the latter :—

this diameter increases the uterus rotates and the tumours will occupy the transverse diameters of the pelvis, and if they continue to grow the whole of the available space in the pelvis will be occupied, and one of the tumours being lodged under the sacral promontory prevents the mass rising above the pelvic brim. This leads to complications with the rectum and bladder. One of the common causes of acute impaction of a dumb-

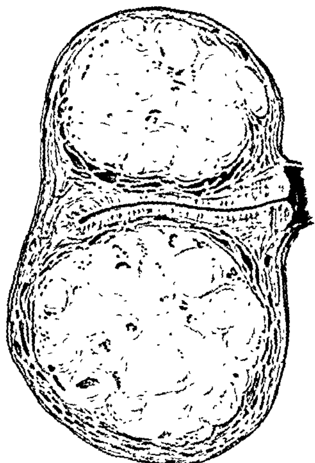


FIG. 51. UTERUS IN SAGITTAL SECTION. It is occupied by twin-fibroids which give it a 'dumb-bell' shape The larger tumour occupied the posterior wall; it was lodged in the pelvis and had an average diameter of 9 cm. The smaller fibroid grew in the anterior wall and lay in the hypogastrium. The cavity of the uterus was at right angles to its normal position, and the endometrium is œdematous.

bell shaped uterus is pregnancy. It can be easily understood that when a uterus has a fibroid in the anterior and another in the posterior wall, one being as big as a cricket-ball and the other the size of a tennis-ball, if the woman should be unlucky enough to become pregnant the quickly-enlarging uterus in the pelvis causes awkward complications, and in many instances leads to surgical interference. Without surgical aid miscarriage occurs and occasionally ends disastrously.

There is a form of incomplete torsion of the pedicle which occurs in pedunculated subserous fibroids, such as is represented in Fig. 57, p. 133. Subserous fibroids with a thin stalk do not enlarge the uterus, and it is curious to see a tumour of this kind, weighing ten pounds or more, attached to a uterus of normal size. Such fibroids are usually cystic, due to degenerate changes induced by frequent interruption in the circulation through the narrow pedicle, caused by partial rotation of the tumour twisting and straining the narrow stalk.

Cervix Fibroids. The operative treatment of this variety needs separate consideration, for these tumours do not lend themselves to any routine method. Cervical fibroids of moderate size can be easily enucleated by the vaginal route, large examples demand hysterectomy. Of all the varieties of fibroids none can cause so much difficulty in an operation as the cervix-fibroid, and, as a rule it begins at the outset of the operation, for on opening the abdomen the surgeon finds the pelvis filled with an ovoid tumour with the uterus perched on its summit, like the lantern on the dome of a cathedral.

When the uterus, with the tumour in its neck, is not large enough to fit the pelvis tightly and can be drawn up, the operation can be easily and expeditiously performed. A tumour may be so firmly impacted that it cannot be drawn up; in such conditions the broad ligament should be divided on each side: this often facilitates the elevation of the parts, and permits access to the uterine arteries which lie on the lateral wall of the expanded cervix. (The bladder is a source of difficulty in dealing with these tumours, for it is often pushed out of the pelvis and its walls are sometimes very thick.)

In performing subtotal hysterectomy, the surgeon cuts through the thick cervix below the tumour, but in removing a central cervical fibroid he incises what appears to be the capsule of the tumour, but it is in fact the expanded cervix, and in this part of the operation he divides the uterine arteries. The cut edges of the expanded sac usually bleed freely. After the tumour is enucleated the cup-shaped sac quickly shrinks; the vessels in its walls are ligatured, and the edges of the expanded cervix approximated with sutures, and the ovarian pedicles secured in the usual way. As soon as the tumour is removed the bladder retracts into the pelvis and assumes its normal position.

Occasionally a central cervix-fibroid is so tightly impacted in the pelvis that even after the broad ligaments have been divided it cannot be raised out of the pelvis. In such a case it is a good plan to split the uterus longitudinally, taking care not to incise the bladder, then, after incising the capsule, the tumour as a rule enucleates easily. The enucleation of a large impacted fibroid requires to be conducted without undue display

A spinster, aged sixty-seven, sought advice on account of pain, discomfort, and frequency of micturition associated with a tumour which could be felt in the hypogastrium. It presented the usual features of a fibroid. When exposed in the course of an operation performed for its removal the tumour was as big as the head of a new-born child. Its anterior surface was pearly white in consequence of a deposit of organized fibrin, produced by the friction of the tumour against the abdominal wall. On withdrawing the tumour from the belly, the pedicle was found to be twisted like a rope; on untwisting it, the ovaries, uterine tubes, and uterus were recognized. Subtotal hysterectomy was performed; after removing the uterus I torsioned the parts to the same degree as before removal, and hardened the specimen in a solution of formalin for preservation. The fibroid had undergone degenerative changes coincident with age, I think, and in no way a consequence of the torsion (Fig. 53). The thickness of the tissue forming the milk-white patch on the surface of the fibroid proves it to be an old tumour. It is conceivable that the involvement of the uterus was due to, if indeed the whole movement was not facilitated by, the atrophic condition of its neck, and it is probable that the absence of acute symptoms depended on the senile condition of the uterus. B. S. Schultze collected the cases up to 1906, and Kynoch reported an interesting example in 1912. Axial rotation of an ovarian cyst with a short pedicle will sometimes involve the uterus in the twist.

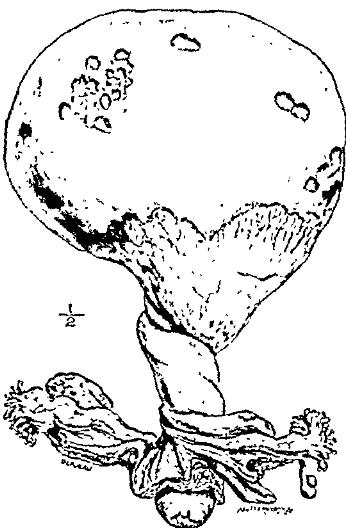


Fig. 53 A Sessile Subserous Fibroid which had undergone axial rotation, involving the uterus and the appendages in the twist. From a spinster aged 67.

OPERATIONS FOR THE REMOVAL OF FIBROIDS FROM THE BROAD LIGAMENT

Fibroids of large size unconnected with the uterus and growing between the layers of the broad ligament are often troublesome tumours to remove. On opening the abdomen, the surgeon recognizes the nature of the tumour-mass when he finds that the uterus is not incorporated with it, and the tumour itself covered with a thin, loose, transparent veil of peritoneum. On incising the peritoneal covering, the fibroid is easily enucleated, and, as a rule, there is free bleeding from the large veins in its capsule, especially in the vicinity of the bladder. The process of

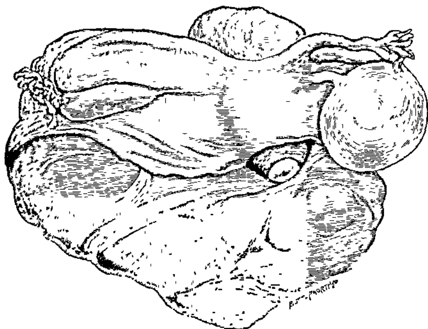


FIG. 54 FIBROID OF THE LEFT BROAD LIGAMENT. The uterus rests upon, but is not involved in, the tumour. A process of the fibroid bulges between the ovary and the tube. The right ovary is cystic From a married woman aged 52.

enucleation should be conducted carefully, for the ureters lie below the tumours and in this operation are easily injured. The bladder is spread out over the surface of a broad ligament fibroid and runs great risk of being cut. When the tumour is very large and has interfered with the bladder so as to cause chronic retention of urine, the vesical walls, as a result of repeated distension, become thin and resemble peritoneum: in such conditions a large portion of the bladder is sometimes accidentally cut away with the tumour. On one occasion, in such a case, I cut off the upper third of the bladder, but recognizing my fault, carefully joined the divided edges of the bladder with very fine silk sutures and drained it with a self-retaining catheter for ten days. The woman recovered.

of force, or so much shock will be caused as will place the patient's life in peril. After the tumour has been enucleated the expanded cervix quickly contracts, and the operation is completed on the lines of a subtotal hysterectomy. Experience teaches that, as a rule, it is easier and safer to split the body of the uterus (hemisection) and enucleate a cervix-fibroid than to remove the uterus, cervix, and fibroid as one mass.

In some of my early operations for cervix-fibroids I was anxious to save the uterus; after enucleating the tumour and tying the cut blood-vessels, the edges of the incision in the expanded cervix were sewn together. In two instances I split the uterus in two lateral halves, and after shelling the fibroid out of the expanded cervix, sutured the two halves of the uterus together. These cases recovered, but on the whole the removal of the uterus with conservation of an ovary is a safer and more satisfactory proceeding. There are, of course, conditions where the surgeon feels justified in making great efforts to save the uterus even at an increased risk to the patient's life. Here, as in so many other surgical procedures, the surgeon has to exercise judgement and discretion.

When a fibroid grows from the posterior aspect of the cervix immediately beneath the peritoneum it affects the cervix very differently to one growing within it, for the neck of the uterus is stretched, but not distended, by the tumour. In such a condition, after dividing the broad ligaments and obtaining access to the pelvis, it is a good plan to split the capsule covering the tumour posteriorly, and then enucleate the fibroid; this accomplished, the operation reduces itself to a subtotal hysterectomy, but there is this difference, the surgeon will, when the tumour is big, find a pouch formed by the portion of the capsule which covered the lower pole of the fibroid: this pouch extends lower than the point at which the cervix is divided, and the vaginal stump of the cervix lies in the anterior wall of the pouch. Before suturing the stump, it is a good practice to split this portion of the cervix longitudinally with scissors in order that blood and serum from the pouch may freely escape into the vagina.

In some examples of cervix-fibroids, after removing the uterus and making the blood-vessels secure, instead of stitching the edges of the expanded cervix together, it is only necessary to sew the peritoneum over the cut edges.

Fibroids growing from the anterior aspect of the cervix either bulge into the vagina or rise into the hypogastrium The former can be safely enucleated by the vagina, those which grow into the hypogastrium sometimes strip the peritoneum from the anterior abdominal wall for two or three inches, or more. Occasionally such tumours can be removed through a median sub-umbilical incision without opening the peritoneal cavity.

(Fig. 55). When the body of the uterus is double (bicornate), and the surgeon stumbles upon it in the course of a pelvic operation, he may be puzzled if he is not familiar with the anatomical conditions associated with this malformation.

When the body of the uterus is bicornate the rectum lies in the middle line of the pelvis, and a median vertical fold of peritoneum, the *ligamentum vesico-rectale*, passes from its anterior aspect through the gap between the uterine cornua to become continuous with the peritoneum covering the posterior surface of the bladder (Fig. 56). That portion of the vesico-rectal ligament which lies between the rectum and the neck of the uterus divides the recto-vaginal fossa into a right and a left half. This peritoneal ligament requires careful treatment, or the surgeon may

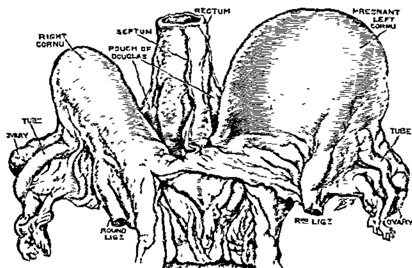


FIG. 56. A BICORNATE UTERUS SHORTLY AFTER DELIVERY. The pregnancy occurred in the left half. The vesico-rectal ligament is well shown.

accidentally open the rectum or the bladder. In closing the peritoneum over the cervical stump it is sometimes necessary to bring the edges of the abnormal fold into apposition vertically by a continuous suture.

In a case of this kind in which I performed total hysterectomy for cancer of the neck of the uterus the extensive peritoneal connexions were somewhat troublesome, and when the uterus was removed it seemed as if the floor of the pelvis had been stripped of its serous covering. The bifid nature of the uterus had been anticipated before the operation, as an imperfect vertical septum was known to exist on the posterior vaginal wall. I removed, from a spinster, aged fifty-four, a uterus which contained a quickly growing fibroid. The tumour, when the abdomen was opened, appeared to be an intramural fibroid in the fundus of the uterus; it was ovoid and its upper pole reached as high as the ensiform cartilage. On

Three years later I was able to investigate the capacity of the bladder and found that it could hold fifteen ounces of urine.

The tumour represented in Fig. 54 occupied the left half of the broad ligament; after the enucleation, I could see the terminal four inches of the ureter lying on the floor of the cavity left by the removal of the fibroid. The bladder was carefully detached from the surface of the tumour, and the cavity drained with a rubber tube. Next day the dressings were soaked with urine, and it was uncertain whether the urine leaked from the ureter or the bladder. The drainage-tube remained in position ten days; the leakage of urine gradually diminished and finally ceased. The patient made a quick and permanent recovery.

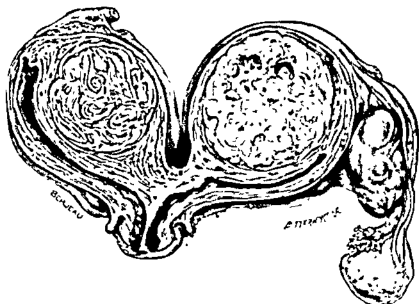


FIG 55. A BICORNATE UTERUS This uterus is shown in frontal section; each cornu contains a fibroid Removed from a spinster aged 32 on account of acute pain, probably caused by the axial rotation of one cornu. Two-fifths size.

Experience teaches that in removing a mesometric fibroid the operation is made safer by the removal of the uterus. In many cases the surgeon has no choice, but occasionally he is tempted to leave the uterus, but it is an unwise step which leads to troublesome bleeding. Removal of the uterus enables the surgeon to make hæmostasis more complete.

The two chief causes of the high mortality of operations performed for the removal of broad-ligament fibroids are injury to the ureter, and uncontrollable venous bleeding. The bladder and ureters are more often injured in the removal of mesometric fibroids than in any other pelvic operation. It is fortunate that such tumours are uncommon.

On hysterectomy when the uterus is double. Fibroids and cancer arise in malformed uteri, as well as in those of normal shape

made in cases of subtotal hysterectomy. The investigation was conducted by two independent observers (Somerville Hastings and C. H. S. Webb), and their findings tallied uniformly and were confirmed by the clinical course of the patients. In the majority, especially nulliparous spinsters, the cervical canal and uterine cavity were sterile. Married women who have had children, and in whom the mouth of the womb is patulous, staphylococcus, bacillus coli, and Döderlein's bacillus occur. In extruded fibroids streptococci exist sometimes in pure culture and occasionally mixed with the colon bacillus. The proportion of cases is small in which pathogenic micro-organisms are found, but they are more common in a uterus containing a submucous fibroid when the patient is multiparous, than in that of a nulliparous spinster with a narrow cervical canal.

In regard to the fibroids : I have had very many examined, especially those which have undergone degenerative changes, such as softening and red degeneration. In all cases, except one, where the red degeneration was associated with pregnancy, the fibroids have been sterile. The exception occurred in a subserous fibroid which was associated with pregnancy and was the most acute example of red degeneration I have seen. A staphylococcus was grown from it. The comparative freedom of the uterus from pathogenic micro-organisms explains the great success of subtotal hysterectomy. Streptococci exist in the cervical canal sufficiently often to entail on this important operation a risk of a peculiar kind ; they hinder convalescence in a considerable number of patients, and entail the death of a few. (See Pulmonary Embolism.)

When we turn to cancer of the neck of the uterus, the picture is quite different, for the morbid tissue in this disease abounds in micro-organisms, such as the staphylococcus, streptococcus, the colon bacillus, bacillus pyocyaneus, &c. The streptococcus occurs either in pure culture in carcinoma of the cervix or in company with the staphylococcus and colon bacillus ; it is extremely virulent for the peritoneum. The presence of the streptococcus is important in another aspect. This micro-organism not only infects the pelvic tissues in the course of the operation, but the gloves of the surgeons are contaminated ; this leads to infection of the sutures used to close the wound.

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examining the parts after the operation, it proved to be an intramural fibroid growing between the horns of a double uterus of the variety known as *uterus bicornis unicollis*. The operation was as simple as when the uterus is normal. The patient made an excellent recovery.

Experience teaches that bicornate uteri cause more difficulties in diagnosis than in technique, but the presence of the vesico-rectal ligament would probably bar the removal of the uterus by the vaginal route. The existence also of a median longitudinal septum, partial or complete, in the vagina would be another difficulty.

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Kamann Uterus bicornis unicollis with a Myoma in the Left Horn; Subtotal Extirpation of the Left Horn *Centralbl f Gyn.*, 1905, xxix. 795.

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THE FLORA OF THE UTERUS IN RELATION TO HYSTERECTOMY

Micro-organisms play a great part in the production of uterine disease. Injuries of the uterus of all kinds are often more serious from sepsis which follows such accidents than from actual damage to the organ. The micro-organisms of the uterus also influence in a remarkable degree the results of hysterectomy. For example, the death-rate of hysterectomy for fibroids is under 2 per cent., whilst the removal of the uterus for cancer of its neck by the abdominal route is 20 per cent. This difference in the results of hysterectomy for fibroids and for cancer of the neck of the uterus depends on the flora of the uterus.

The uterus of virgins, as a rule, contains no micro-organisms. Being desirous of ascertaining the bacteriologic condition of the cervical canal and the uterine cavity of women with fibroids I had a series of observations

would lead to its enlargement. The heart is an adaptable organ: it was formerly taught that it enlarged during pregnancy and returned to its natural size during the puerperium, but statements of this kind could only be founded on speculation. When a vascular fibroid, weighing thirty pounds, has been removed from an otherwise healthy woman, it is not unreasonable to expect that the amount of work required of the left ventricle would be reduced, therefore, the muscle tissue in that part of the heart would *undergo a corresponding reduction.*

Lesions of the thyreoid gland. The thyreoid gland is another organ believed for ages to be in correlation with the reproductive organs, and modern physiological and pathological researches confirm the tradition.

On three occasions I have removed a uterus containing fibroids from women who, at the time of the operation, possessed enlarged thyreoid glands. The goitres being of the parenchymatous type, I have been surprised, on seeing the patients six months after the hysterectomy, to notice marked diminution in the size of the goitrous thyreoids.

In 1908 a spinster, aged 44, suffered from menorrhagia due to multiple fibroids, but she also suffered from exophthalmic goitre and the thyreoid was enlarged and pulsated strongly. It occurred to me that as the removal of the uterus for fibroids caused goitrous thyreoids to shrink, such a sequel might be expected if the uterus were removed from this patient. After a careful consideration of the circumstances, I decided to remove the uterus with the ovaries and tubes by the subtotal method. The operation was carried out in the Middlesex Hospital; it lasted twelve minutes. Chloroform was employed for the anæsthesia. Before operation the patient's temperature was 99° Fahr., and the pulse-rate 130. Twenty hours after the operation her temperature was 102° Fahr., and the pulse-rate 140 per minute, but the thyreoid gland had markedly diminished and the eyeballs were less prominent. Forty-eight hours after the operation she was in a desperate condition , the temperature was 104° Fahr. ; pulse-rate 180 per minute, the thyreoid gland had further diminished in size, and a condition of acute thyreoidism prevailed. The patient died fifty-six hours after the operation. A post-mortem examination was not permitted by the patient's friends.

Diabetes. This is a condition which will sometimes place the surgeon in a quandary when he is considering the propriety of advising hysterectomy for fibroids. I have performed this operation on three occasions in diabetics. One case is instructive. A widow, aged 43, passed sugar in her urine to the extent of 5 grains per ounce. She also suffered from menorrhagia, her menstrual periods lasting on an average ten days ; the elongation depending on a large submucous fibroid. She

VISCERAL COMPLICATIONS ASSOCIATED WITH FIBROIDS IN RELATION TO HYSTERECTOMY

Fibroids, being common tumours, are often present in patients suffering from diseases in organs which have no intimate connexion with the uterus. From time to time attention is drawn to the remote effects which rapidly-growing uterine fibroids may exert on the heart, or the thyreoid gland. We know that the pressure of a large fibroid can, and often does, exert a deleterious effect on the bladder, but albuminuria may be present and have no relation to the fibroid. Another disease occasionally associated with fibroids is diabetes. It is necessary to discuss some of these conditions.

Cardiac Lesions. It has been maintained by several writers that submucous fibroids exert a causative influence in the production of heart disease, especially when they cause menorrhagia. It is quite true that many patients with fibroids in the uterus have valvular lesions as the result of rheumatic fever, and in many who have been reduced to a condition of profound anæmia by profuse menstruation, the heart will furnish a hæmic murmur on auscultation. I have had careful observations made on the cardiac condition of patients with fibroids under my care; there is nothing that can be described as peculiar to the influence of these tumours.

On a dozen occasions I have removed a uterus containing large tumours, when the heart has furnished a murmur clearly due to a valvular lesion. In such circumstances the patient is always submitted to a careful examination at the hands of a physician, and if the compensation be satisfactory, the operation is undertaken. There are conditions when the removal of a large fibroid may benefit a patient with heart disease. For example: A stout patient, aged fifty, with a huge ovarian cyst and a fibroid as large as a football, suffered from severe attacks of dyspnœa, due to a dilated heart and myocarditis. The anæsthetist would not give her a general anæsthetic, but I felt if the tumour could be removed great relief would follow. Chloroform, in any form, or in any combination, being out of the question, I resorted to an intradural injection of novocaine and removed the tumours. The operation was followed by a rapid convalescence; the cardiac symptoms disappeared, and within three months the woman was robust and well, leading an active and useful life.

When we consider the enormous size and vascularity of some fibroids we might readily believe that the extra duty thrown upon the heart

FIBROIDS AND PREGNANCY

It is well to note that when fibroids are associated with pregnancy—uterine, tubal, or cornual—the operative procedures are in no way rendered difficult and the consequences, immediate and remote, are invariably favourable. Perhaps the rarest combination of this kind is the co-existence of fibroids and hydatidiform degeneration of the chorion. I have had one such case. The masked signs of pregnancy accompanying this degenerate form of conception occasionally mislead surgeons. Mrs. Scharlieb extirpated the uterus under the impression that it contained a soft degenerate fibroid, and on incising the uterus a dead fœtus of the third month was found in its cavity but no fibroid. The patient was aged 51. Such a combination would mislead many.

It is remarkable, considering the frequency with which fibroids interfere with the bladder, that hydronephrosis so rarely occurs as a serious complication. I had under my care a woman with a fibroid impacted in the pelvis and a definite movable tumour in the left loin as big as an ostrich's egg. I regarded this as a hydronephrotic tumour secondary to the pressure exerted on the left ureter by the fibroid in the pelvis. Hysterectomy was performed, and on its completion I was able to reach the movable cystic kidney quite easily through the median incision, and after dividing the left meso-colon, the pedicle was ligatured and the kidney detached. On examining the parts after removal I was astonished to find the ureter thin and narrow, the pelvis was dilated and the kidney sacculated but not in consequence of pressure on the ureter, and the trouble in the kidney could not be attributed to the fibroid.

FIBROIDS AND CANCER OF THE COLON

Fortunately uterine fibroids rarely contract adhesions to the intestines unless the uterus and uterine tubes have been the seat of infection, gonorrhœal or puerperal. It is unusual for the surgeon to be hampered with bowel complication when he undertakes hysterectomy for fibroids, but there are two conditions in which he may have to deal with cancer of the sigmoid colon, or the upper part of the rectum. It has happened to me on three occasions in the course of removing the uterus for fibroids to find cancer of the sigmoid colon After completing the hysterectomy I excised the cancer in the colon and joined the cut ends of the bowel by an end-to-end anastomosis. In a woman much blanched from profuse uterine bleeding due to a cervical fibroid I removed the uterus and its neck (total hysterectomy), and in adjusting the intestines preliminary to closing the incision detected a cancerous focus in the sigmoid colon.

wished to re-marry and was deterred from doing so, not by the glycosuria, but by the menorrhagia. She wished to have the tumour removed. I performed subtotal hysterectomy. The patient made a quick and uneventful convalescence, re-married, and was in good health three years after the operation.

All patients who come under my care for hysterectomy have their urine examined for sugar. It is a serious responsibility to operate upon a patient whose urine contains sugar, but the risk must be faced in exceptional cases of which the following is an example:

A married woman, aged 69, had a fibroid as big as a football. There was free bleeding from the vagina at frequent, but irregular intervals, which led us to suspect that cancer existed in the body of the uterus as well as a fibroid. The condition was complicated by diabetes, the sugar amounting to ten grains per ounce of urine. Abdominal hysterectomy was performed in 1904. The uterus contained a large submucous fibroid and a cancerous mass as big as a tennis-ball. The patient recovered quickly and was reported to be alive and well eight years afterwards (December 1912).

PELVIC COMPLICATIONS

Among the complications which the surgeon may find in the abdomen when he embarks on the performance of hysterectomy the following may be mentioned:

Fibroids are often associated with cysts of the ovary, large and small. Twenty-five years ago it was the common practice to remove the ovarian tumours and leave the fibroids to shrink To-day the uterus is removed with the cysts.

It is a common thing in the course of abdominal hysterectomy to find the vermiform process thickened, inflamed, or adherent to a fibroid. In such circumstances it should be removed. It happens occasionally that patients make it a condition of the operation that the vermiform process be removed as well as the uterus. I invariably conform to their wishes, but I do not remove the vermiform process as a routine measure.

On three occasions I have removed the gall-bladder in the course of a hysterectomy for fibroids In each patient it was enlarged and filled with gall-stones. In these three cases the uterus was so big that an incision was needed reaching nearly as high as the xiphoid cartilage to enable the tumours to be withdrawn from the abdomen. In such conditions the gall-bladder was easily accessible, and easily, as well as safely, removed. In two other instances of this combination I removed the gall-bladder six months after hysterectomy.

account of profuse uterine bleeding due to a submucous fibroid as big as an orange. She was anxious to return to India and casually asked me to examine a lump in her breast. It was an undoubted carcinoma. I therefore performed subtotal hysterectomy at the Middlesex Hospital, 1911, and at the same time removed the diseased breast. The tumour was examined microscopically and showed the typical signs of cancer. The patient made a quick recovery from the double operation.

The third case was a spinster aged 54, with an enormous fibroid and an unmistakable cancer in the breast. As she was much embarrassed by the uterine fibroid I decided to perform the double operation. On this occasion, as respiration was much impeded by the fibroid, I performed hysterectomy, then amputated the breast and cleared out the axilla. I think this is the wiser course. The patient made a quick and uninterrupted recovery.

SARCOMA OF THE TIBIA AND FIBULA

In 1909 the wife of a medical practitioner who suffered severely from menorrhagia and pain due to a uterine fibroid was anxious to have the uterus removed. In the course of the consultation she casually drew my attention to a swelling on her tibia which presented the clinical signs of a periosteal sarcoma. In order to make the diagnosis definite, I excised a fragment of the tibial tumour and examined it microscopically. It was a spindle-celled sarcoma. I amputated the leg through the knee-joint. After the patient recovered from the operation the menorrhagia caused so much trouble that she requested me to remove the uterus. Hysterectomy was performed in November 1911. She was reported to be in good health in December 1912.

THE RISKS OF ABDOMINAL HYSTERECTOMY FOR FIBROIDS

The dangers of hysterectomy are those common to all forms of abdominal operations such as sepsis, peritonitis, shock, and the risks of the anæsthetic. There are certain special dangers such as hæmorrhage; injury to the pelvic segments of the ureters, and especially the bladder; injury to the intestines, and especially the rectum; acute intestinal obstruction; thrombosis and pulmonary embolism. These risks and dangers are considered in a special chapter (p. 13).

Among rarer forms of death after hysterectomy may be mentioned acute perforation of the stomach or the small intestine; cerebral hæmorrhage; lobar pneumonia; thrombosis of the right auricle; embolism of the femoral artery ending in gangrene; suppression of urine; and acute mania. These are causes of death which follow any major operation in surgery, and have no special connexion with hysterectomy.

The patient had sustained a serious operation, and in her weak condition I did not think it wise to excise the bowel. She made an excellent recovery and was kept under observation: two months later I excised the growth from the sigmoid and she recovered easily from the operation.

The growth of cancer in the colon is slow and insidious, and there is a massive form of colic cancer which, during its symptomless stages, especially when the mass lies in contact with the uterus, furnishes signs indistinguishable from a subserous fibroid. The diagnostic signs are sometimes especially deceptive if there should, at the same time, be a few small hard fibroids in the uterus.

On several occasions I have found it difficult to decide the nature of a pelvic swelling. Sometimes I have undertaken an abdominal operation hoping to find an impacted fibroid, but have found a hard cancerous growth in the sigmoid colon impacted in the pelvis, and the operation has ended in colotomy. In happier cases I have started on the operation with strong suspicions that the patient had a malignant mass in the bowel, and found an impacted fibroid. The most evil combination is to find a patient with a fibroid of moderate size in the uterus and a massive cancer of the sigmoid colon adherent to it. Here colotomy is the usual remedy.

I am not alone in such experiences, because some of my colleagues have occasionally stumbled on a cancerous pelvic colon in mistake for a fibroid and have handed the patients to their surgical associate for the operation of resection.

CANCER OF THE BREAST AND FIBROIDS

A very cursory study of morbid anatomy will suffice to show that many women who die with cancer of the breast have fibroids in the uterus. In spite of this it is rare for a woman to come under observation with a troublesome uterine fibroid and cancer of the breast. In 1905 a schoolmistress, aged 54, had a very large fibroid which she was anxious to have removed because it interfered with her activity. At the same time she drew my attention to an obvious cancerous lump in her breast. After careful consideration I performed subtotal hysterectomy, removing both ovaries. After closing the abdomen I excised the cancerous breast and the axillary lymph glands. I removed both ovaries with the hope that she would obtain whatever inhibitory effects bilateral oöphorectomy is supposed to exercise on mammary cancer.

The patient recovered easily from the double operation and died from recurrence and internal dissemination five years later.

I have performed this double operation on two other patients:

A patient doing missionary work in India was invalided home on

pregnancy and fibroids co-exist, for this combination is sometimes so dangerous to the life of the mother as to render an operation necessary.

In 1901 I collected and published a dozen cases in which subtotal hysterectomy had been performed for this combination. Since that date a large number of cases have been reported, and as this experience is crystallized in practice it is unnecessary to adduce further evidence in its favour. I have performed subtotal hysterectomy with success for big fibroids complicated with tubal pregnancy.

Hysterectomy is sometimes required when labour is obstructed by a fibroid. In this event some surgeons prefer the total, and others the subtotal method. When hysterectomy is performed during labour, the cervix is so thin and expanded that it is difficult in the course of the operation to determine the junction of the cervix with the vagina.

In 1901 I collected some records relating to labour obstructed by uterine fibroids ; most of them revealed a grim history of tragedy and woe. A broad survey enabled me to form the opinion that ovarian tumours have caused great trouble to parturient women, but fibroids have been more lethal as they frequently become septic during the lying-in. The whole subject is an instructive and impressive illustration of the baneful effects which environment often imposes on so-called innocent tumours. The subjoined table indicates that surgical interference when labour is obstructed by fibroids is more merciful to the mother than to her offspring.

CASES OF HYSTERECTOMY PERFORMED ON PATIENTS IN LABOUR FOR OBSTRUCTION DUE TO FIBROIDS

Operator	*Result to Mother*	*Fate of Child*	*Nature of Operation*	*Reference.*
Spencer	R	L	Cæsarean Section, Subtotal Hyst	*Trans. Obstet. Soc*, xxxviii. 389.
Bland-Sutton [1]	R	D	Total Hyst.	*Trans. Obstet. Soc.*, xlvi. 238.
Morison	R.	D	Cæsarean Section, Total Hyst.	*Northumberland and Durham Med. Journ*, 1904.
Acland	R	?	Cæsarean Section, Subtotal Hyst	*Lancet*, 1904, ii. 948.
Spencer	R	L.	Cæsarean Section, Total Hyst.	*Trans Obstet. Soc.*, 1906, xlviii. 240.
Spencer	R.	D	Cæsarean Section, Total Hyst.	*Trans. Obstet. Soc.*, 1908
Bland-Sutton	R.	L	Cæsarean Section, Total Hyst	1912, unpublished.

[1] This is the first recorded case of total hysterectomy during labour. Operation May 9, 1904.

Mortality. In order to give some idea of the great improvement which has taken place in the operation of abdominal hysterectomy for fibroids in London, the following figures will be found of great interest.

In the year 1896 the results of abdominal hysterectomy for fibroids in the hospitals of London may be inferred from the following table:—

St. Bartholomew's	7	with	3	deaths
St. Thomas's	5	,,	2	,,
St. George's	1	,,	0	,,
Middlesex	6	,,	1	,,
University College	3	,,	0	,,
Samaritan	17	,,	4	,,
Soho (for women)	1	,,	0	,,
Chelsea Hospital for Women	9	,,	1	,,
	49	,,	11	,,

In these hospitals and the New Hospital for Women the returns in 1906 are as follows:—

St. Bartholomew's	26	with	4	deaths
St. Thomas's	40	,,	2	,,
St. George's	8	,,	0	,,
Middlesex	50	,,	0	,,
University College	21	,,	1	,,
Samaritan	37	,,	2	,,
Soho (for women)	60	,,	1	,,
Chelsea (for women)	80	,,	1	,,
New (for women)	26	,,	0	,,
	348	,,	11	,,

During the years 1906 and 1907, at the Middlesex Hospital and the Chelsea Hospital for Women, I performed abdominal hysterectomy for fibroids on 101 patients and they all recovered: the series continued unbroken until I had performed 130 of these operations without a death.

My predilection for subtotal hysterectomy may be gathered from the following statement: Mr. C. H. S. Webb, Surgical Registrar to the Middlesex Hospital, has examined my case-records. He finds that among the last 109 abdominal operations for fibroids I have performed in that institution, 103 were subtotal and 5 total hysterectomies. There was one abdominal myomectomy. All these patients recovered. (March 1, 1913.)

As a rule, subtotal hysterectomy is simpler than the total operation. There are conditions in which it is imperative to remove the whole cervix, especially when it is big and hard, or big and spongy: or when the cervical canal is wide and perhaps septic, and especially if there is the least suspicion that the neck of the uterus is cancerous (see p. 136).

Subtotal hysterectomy is a safe method for removing the uterus when

CHAPTER II

ABDOMINAL MYOMECTOMY

Under this general term it is usual to include operations for the removal, through an abdominal incision, not only of pedunculated subserous fibroids, but also sessile and interstitial (intramural) fibroids of the uterus.

The earliest operations of this kind were performed by Spencer Wells (1863); but little attention was given to this matter until the advantages of abdominal myomectomy were strongly advocated by A. Martin (1880) and Schroeder (1893). The operation has been practised by many surgeons and gynæcologists imbued with conservative ideals in regard to the uterus. In its early days the operation was attended with a very high mortality, but the great improvements in hysterectomy have limited very materially the scope of abdominal myomectomy.

ABDOMINAL MYOMECTOMY AND ENUCLEATION FOR FIBROIDS

Abdominal myomectomy. This signifies the removal of one or more pedunculated subserous fibroids through an incision in the abdominal wall, preserving the uterus, uterine tubes, and the ovaries.

Abdominal enucleation. In this operation a sessile fibroid is shelled out of its capsule: the uterus, ovaries, and tubes are preserved.

Hysterotomy. In this operation a submucous fibroid is removed, through an incision in the wall of the uterus, which opens the uterine cavity.

The preliminary steps for each of these procedures is the same as for ovariotomy, and the Trendelenburg position is of great advantage.

After opening the abdomen the intestines are carefully protected by a warm dab, and the tumour carefully examined When the stalk is narrow it may be transfixed and secured with silk thread, like the pedicle of an ovarian cyst. When the pedicle is short and broad the tumour should be shelled out of its capsule, and any obvious blood-vessel is secured with forceps and ligatured with silk. The flaps of the capsule are brought into apposition by mattress sutures, and the redundant portions of the capsule cut away and the free edges carefully brought together by a continuous suture of thin silk.

On two occasions I have found a subserous fibroid of moderate size, growing from the posterior wall of the uterus by a long stalk, so firmly

Hysterectomy has been performed successfully on patients over 70 years of age. My experience of the subtotal operation in patients after the menopause proves it to be even safer than during menstrual life. The atrophy of the cervix after the fiftieth year of life leads to the formation of a thin and almost bloodless stump that gives no trouble during the operation afterwards.

TABLE OF CASES IN WHICH HYSTERECTOMY WAS PERFORMED ON WOMEN OF 70 YEARS AND UPWARDS

Reporter.	*Age.*	*Nature of Operation.*	*Result.*	*Reference.*
Bland-Sutton	73	Subtotal for Fibroid 28 lb.	R.	*Trans. Obstet. Soc.*, 1900, xli. 300.
Bland-Sutton	70	Subtotal for Fibroid	R.	*Middlesex Hosp.*, 1910.
Stewart McKay	70	Subtotal for Fibroid 19 lb.	R.	*Australian Med. Gaz.*, 1907, 14.
Bland-Sutton	83	Vaginal Hyst. for Villous Disease	R.	*Trans. Obstet. Soc.*, 1906, xlix. 46.
Malcolm	71	Total for Fibroids	R.	*Brit. Med. Journ.*, 1907, ii. 1571.

be carried out in a small proportion of cases, probably in less than 10 per cent., and it is fair to state that enucleation and hysterotomy are often more troublesome and serious operations than hysterectomy; also the preservation of the uterus is not always an advantage to the patient.

When a woman is submitted to hysterectomy for fibroids we can assure her that the tumours will not recur, but after a myomectomy or enucleation in a woman in the reproductive period of life we cannot give her this assurance, for she may have in her uterus many 'seedlings' or 'latent fibroids', and one or several of these may grow into formidable tumours.

There are three conditions in which myomectomy and enucleation are legitimate procedures:

1. A young woman contemplating marriage, or a married woman anxious for offspring, if her tumour be single and admits of myomectomy or enucleation, may have her uterus spared. Although I have carried out these measures on many occasions, I only know of five patients who have subsequently borne children.

2. Occasionally in pregnancy.

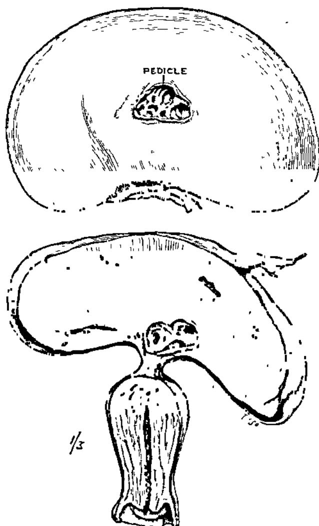


FIG. 57. UTERUS AND SUBSEROUS FIBROID IN SECTION The fibroid has a narrow vascular stalk Pedunculated subserous fibroids do not cause the uterus to enlarge. The tumour, in shape and mobility, furnished the clinical signs of a wandering spleen.

3. Myomectomy is a very safe undertaking in patients at or after the menopause, where a stalked fibroid gives trouble by twisting its pedicle, or by shrinking to such a size that it falls into the true pelvis and becomes impacted; or, more rarely, the pedicle of such a tumour entangles a loop of small intestine and obstructs it.

In order to give the matter a statistical basis I have drawn up an

impacted in the pelvis that it could not be extracted; the uterus was also tightly compressed in the pelvis by the fibroid. In these circumstances I found the operation greatly facilitated by dividing the stalk of the tumour. The fibroid was then easily extracted.

When a fibroid is embedded in the wall of the uterus, the tumour is exposed by cutting through its capsule and seizing it with a volsella; as a rule it shells out quite easily. This is followed by free bleeding. The vessels are then seized with forceps and ligatured with thin silk. In order to completely control the oozing, mattress sutures are passed through the wall of the capsule on each side, their number varying with the size of the tumour.

The difference in the risks and difficulty of enucleating a fibroid from the uterus and of removing a pedunculated fibroid is easily explained. Pedunculated subserous fibroids do not cause enlargement of the uterus (Fig. 57), but an intramural fibroid, like the submucous variety, leads to great thickening of the uterine walls and increased vascularity. The normal uterus in an adult weighs 2½ ounces. The uterus and tumours represented in Fig. 51 weighed 80 ounces. Of this total weight the tumours represented 64 ounces and the uterus 16 ounces. This increase in the tissues of the uterus is accompanied by increased vascularity, and helps to explain the troublesome bleeding which attends an enucleation.

Although there is less bleeding in the removal of pedunculated subserous fibroids, there is another serious risk to the patients which must not be forgotten, for they are very liable to intestinal obstruction from adhesion of intestine to the stump

In some instances a uterus contains ten or more fibroids, and each must be enucleated and the capsule secured with ligatures, as described above.

Sometimes the oozing is difficult to control, and the surgeon sutures the edges of the capsule to the lower angle of the incision, and stuffs the cavity or bed of the tumour with gauze.

In removing a large submucous tumour through an incision in the wall of the uterus, the surgeon necessarily opens the uterine cavity (hysterotomy). After controlling the bleeding the walls of the uterine incision are closed, as in Cæsarean section.

In many instances in which the surgeon attempts to carry out myomectomy *or enucleation, he has such difficulty in controlling the oozing* that he is driven to remove the uterus.

It is admitted by most writers that the ideal method of dealing with fibroids requiring removal by cœliotomy is to remove them either by ligature or by enucleation. In actual practice this ideal operation of removing the tumours and leaving the uterus and ovaries intact can only

performed enucleation on 124 patients, with 14 deaths. Eight of the patients subsequently came under his notice with recrudescence of the fibroids.

Christopher Martin has performed 73 abdominal myomectomies, with one death. He informs me that he is less inclined to do abdominal myomectomy (except in young married women very anxious for children), as in many cases he has had to perform a second operation for a further crop of fibroids.

My attitude to abdominal myomectomy may be gathered from the following epitome of my experience: In the first 1,000 abdominal operations for fibroids there were 97 myomectomies; in the second 1,000 there were 15.

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analysis of ninety-five consecutive cases of myomectomy and enucleation out of my practice, with the subsequent history of some of the patients. This experience covers a period of twelve years.

Of these ninety-five patients three died as the result of the operation—two from pneumonia in the fourth week after operation, and one a few days after operation: in this case there is reason to believe that the tumour was complicated with cancer of the body of the uterus.

Six of the women were submitted to myomectomy during pregnancy, and in four cases the operation was undertaken under the impression that the tumour was an ovarian cyst which had undergone axial rotation. These cases occurred in the days before I recognized that 'red degeneration' of fibroids complicating pregnancy caused them to be painful and tender. In one patient this complication was clearly recognized. In the sixth patient the tumour was regarded by some capable gynæcologists who examined her as a tubal pregnancy complicating a gravid uterus. Five of these patients went to term and were delivered of living children. The sixth miscarried two months after the myomectomy.

Of the ninety-two successful myomectomies, five subsequently became pregnant and had living children, but in each instance the fibroids were subserous. I have not known a patient to become pregnant after abdominal myomectomy for a submucous fibroid, large or small. In calculating the probability of pregnancy from these statistics it must be mentioned that the patients fall into three categories:

1. Forty women were in the child-bearing period of life and married; many of them were multiparæ.

2. Twenty were single women and probably capable of bearing children in a favourable environment.

3. The remainder were elderly spinsters or barren wives.

A significant feature in the after-history of ten of these women is the fact that some years later other fibroids grew in the uterus, and hysterectomy became a necessity on account of menorrhagia in seven of them; of these, two died from the operation, which was difficult and tedious. One patient was operated upon two years after the myomectomy, and had borne a child in the interval, and the other seven years.

The last fact to mention is that one patient, from whom a submucous fibroid had been enucleated from the cavity of the uterus (hysterotomy), died four years later from cancer arising in the body of the uterus.

Olshausen, in a careful consideration of this question, finds that the chief objection to the abdominal enucleation of uterine fibroids is the high mortality of the operation he states that out of 563 myomectomies collected from 12 surgeons, including himself, 59 patients died, representing a mortality of 10 5 per cent. In the years 1900–5, Olshausen

When cases of cancer supposed to arise in the stump left after subtotal hysterectomy come to be critically analysed, they fall into four groups:

1. The disease existed in the neck of the uterus at the time of the primary operation, but was overlooked.

2. Cancer attacked the cervical stump subsequent to subtotal hysterectomy.

3. The fibroid which necessitated the hysterectomy was really a sarcomatous tumour of the uterus.

4. The suspected growth on the cervix is not malignant, but a granuloma.

Each of these postulates requires separate consideration.

Many observations have been published which show beyond dispute that surgeons have performed subtotal hysterectomy in ignorance that the cervix was already cancerous, and the hæmorrhages of which the patients complained before the operation were due as much to the cancer in the neck of the uterus as to the fibroids. This should serve as a warning that, in cases where the surgeon contemplates performing a subtotal hysterectomy, he should carefully examine the cervix beforehand; at the time of the operation he should also critically examine the cut surface of the cervix, and if it be in the least suspicious he should remove the neck of the uterus. It is necessary to remember that cancer attacks any part of the cervical endometrium, therefore an early cancerous ulcer in the middle of the cervix will run a great chance of being missed by a surgeon who is content with a subtotal hysterectomy.

It is certain that cancer does occasionally attack a cervical stump left after subtotal hysterectomy at such an interval after the operation as to make it certain that the cancer did not exist at the time of the operation. Such a case occurred in my practice. I performed subtotal hysterectomy in 1901 on a woman forty-two years of age, mother of one child; eighteen months later there was a cancerous ulcer on the cervix; the whole of the cervical stump was promptly removed and the nature of the disease established microscopically In 1908 the patient was in excellent health.

In another case under my care I performed total hysterectomy for fibroids in ignorance that the patient had cancer of the cervix. Some months after the operation cancer recurred in the vaginal vault and scar of the hysterectomy; the neck of the uterus had been preserved by the doctor, and on examination the cancer was found. In this instance, although total hysterectomy was performed, it had no effect in staying the course of the disease

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a large globular submucous fibroid from a barren married woman forty-five years of age. Six years later she came under my observation with a large granulating and bleeding growth on the cervix uteri. I had no doubt from the naked-eye characters that this was a primary carcinoma, although it surprised me to find it there, especially as the woman had never been pregnant. On my urgent representations she allowed me to remove the cervix. On microscopic examination the suspected cancer turned out to be a granuloma. Two years later the patient was in good health. Polk has recorded a similar experience. These facts show that caution is necessary in accepting reports of cancer of the uterine stump after subtotal hysterectomy.

Surgeons who have had extensive experience of subtotal hysterectomy for fibroids are unanimous that there is no special liability of the cervical stump left after this operation to become cancerous.

Cancer of the body of the uterus and fibroids. In deciding between total and subtotal hysterectomy for fibroids the probable presence of cancer requires consideration in another aspect. Although uterine fibroids do not predispose to cancer of the neck of the uterus, many writers in recent years have expressed their suspicions that the presence of a submucous fibroid favours the development of cancer in the corporeal endometrium. Piquand, in 1905, drew attention to this matter and emphasized what other observers had pointed out, namely, that a submucous fibroid is often associated with changes in the mucous membrane of the uterus, which not only causes excessive bleeding, but sets up inflammatory conditions giving rise to leucorrhœa, salpingitis, pyosalpinx, and morbid changes in the endometrium, rendering it susceptible to cancer. His statistics support his conclusions, for they represent that in one thousand women with fibroids fifteen will probably have cancer of the body of the uterus. My own observations support this opinion. This complication is found most frequently between the fiftieth and the sixtieth year of life If we narrow the ages of the patient and exhibit the liability in its most emphatic form it would run thus: that in patients submitted to hysterectomy for fibroids over the age of fifty years, about 10 per cent. of them will have cancer of the corporeal endometrium

In 1906 I looked through the case-notes of five hundred patients who had been submitted to operation for uterine fibroids under my care. Of these sixty-three patients had attained the age of fifty years and upwards. Among these sixty-three women there were eight cases of cancer of the corporeal endometrium , the nature of the disease in each case was verified by careful microscopic examination.

The statistics on which this statement is founded were published in

1906; since that date, I have made a careful study of uteri with this sinister combination which have occurred in my practice; these new observations support the conclusion expressed in the preceding paragraph. The following case may be mentioned: A spinster, aged sixty, came under my care with her uterus so enlarged by a submucous fibroid that its fundus reached high above the navel. The existence of the fibroid had been detected by Sir Spencer Wells when the patient was 30 years of age. She complained to me of irregular issues of blood and the increasing size of the tumour. On examining the uterus after its removal, cancer of the endometrium was found in addition to a large fibroid. The patient survived the operation fifteen months.

Consequently, in performing subtotal hysterectomy for fibroids in women of fifty years and upwards, the surgeon should have the uterus opened immediately after its removal and assure himself that the endometrium is free from cancer. If there be any suspicion in this direction he should remove the cervix.

From a careful study of the question, I have formed the opinion that if a woman with fibroids and concomitant cancer of the neck of the uterus seeks advice on account of hæmorrhage, and the cancer has attacked the vaginal portion of the cervix, the nature of the case will be appreciated. The cases likely to be overlooked are those where the cancer is situated somewhat higher in the cervical canal than usual, so that it is not easily detected by the examining finger, and so low in the cervix that the disease is not exposed when the body of the uterus is amputated in the course of a subtotal hysterectomy. A knowledge of this, as well as the fact that cancer of the cervix is almost exclusively a disease of women who had been pregnant, should make the surgeon particularly careful in performing subtotal hysterectomy for fibroids in women who have had children, in order to assure himself that it is not cancerous.

Sarcoma. The most insidious danger which besets the surgeon in dealing with fibroids of the uterus is the occurrence of an encapsuled sarcoma in the guise of an innocent fibroid. I have for some years dropped the name of myoma for these common uterine tumours, preferring to apply the term fibroid in a generic sense to all encapsuled tumours of the uterus. Every histological condition is found in them, from the hard calcified body looking like a block of coral to a soft diffluent collection of œdematous connective tissue, and tumours composed of tissue indistinguishable from that of a spindle-celled sarcoma.

I removed the uterus from a woman forty years of age, which contained a fibroid as big as an ostrich's egg. On section it appeared to be a moderately firm fibroid, with its tissue whorled as is usual in hard fibroids and enclosed in a complete capsule. Some months later the patient

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it causes often great enlargement of the uterus, and under these conditions the fundus can be felt high in the hypogastrium. The patients are often profoundly anæmic as the result of long-continued menorrhagia. The physical and clinical signs of the disease are those present in patients with a large degenerating submucous fibroid. Indeed, the surgeon often removes the uterus under this impression, and, after the operation is completed, when he divides the uterus expecting to see the usual encapsuled tumour, to his surprise finds a uterus with greatly thickened walls.

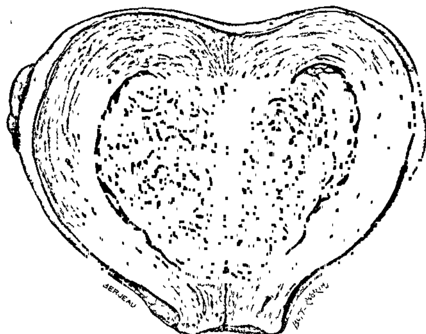


FIG 58 AN ADENOMYOMATOUS AND TUBERCULOUS UTERUS The uterus is opened by a vertical incision in its posterior wall. The anterior wall is occupied by a mass of tuberculous adenomyomatous tissue The patient, a spinster aged 46, was in excellent health four years after the operation. Two-thirds size.

Microscopically the adventitious tissue is made up of irregular tracts of endometrium containing glands and strands of unstriped muscle tissue. This overgrowth is probably due to the action of micro-organisms. Adenomyomatous uteri are often associated with inflammatory affections of the uterine tubes such as chronic pyosalpinx and hydrosalpinx. Occasionally the adventitious gland-mass is tuberculous (Fig. 58).

Sometimes the adenomyomatous change is so localised that it causes a prominence on the serous surface of the uterus and so resembles a sessile subserous fibroid The distinction is only possible with the aid of a microscope. The collection of adenomyomatous tissue (Fig. 59) looked so like a simple fibroid that it would not have been examined microscopically except for the fact that it had implicated the wall of the rectum. This was the first example I had seen in which an adenomyoma

complained of pain, and on examination a hard mass occupied the floor of the pelvis; a portion of this was excised and submitted to three competent histologists, who reported the growth to be an innocent fibroid. The patient died fourteen months after the primary operation with her pelvis filled with recurrent growth. The tumour was a spindle-celled sarcoma.

Sarcoma of the uterine wall—and this is the variety most likely to be mistaken for a fibroid—is commonest after the age of forty and by no means infrequent after the menopause: a solid tumour arising in the uterus after the fiftieth year and growing quickly, is sure to excite suspicion especially if accompanied by hydroperitoneum. There are few complete records of uterine sarcoma, complete in the sense of furnishing an account of the minute structure of the tumour and the subsequent history of the patient. No uterine operation is attended with so little success as hysterectomy for sarcoma.

Cancer of the uterus after bilateral ovariotomy. The uterus, after complete removal of both ovaries, is not only a useless organ, but it may become attacked by cancer. Blacker reported a case in which a woman, thirty-nine years of age, underwent bilateral oöphorectomy for a uterine fibroid: eight years later cancer attacked the neck of the uterus and destroyed the patient.

In 1902 I performed abdominal myomectomy on a woman forty-seven years of age, and removed both ovaries and uterine tubes; the latter contained pus. Four years later this patient came under observation with extensive cancer of the cervix.

In 1901 a patient had bilateral ovariotomy performed; five years later she complained of severe uterine hæmorrhage. I removed the uterus by the abdominal route (total hysterectomy). The corporeal endometrium was cancerous throughout. The patient survived the operation six months Similar cases have been recorded by Martin, Butler-Smythe, Playfair, and Munro-Kerr.

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Adenomyoma of the Uterus. This disease has not received adequate recognition at the hands of British surgeons, yet it is a condition which occasionally causes much doubt in the surgeon's mind in the course of hysterectomy This adenomyomatous change affects the endometrium and is, in some cases, associated with interstitial and subserous fibroids:

organs. This is a feature of this interesting disease as yet imperfectly appreciated by surgeons.

In adenomyoma of the uterus, subtotal hysterectomy gives admirable results; even in cases in which the disease is complicated with tubercle the patients make excellent recoveries, immediate and remote. It is also worthy of note that no instance is recorded in which hysterectomy for this disease has been followed by recurrence. It is probable that

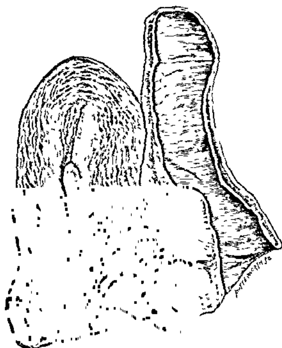


FIG 60. UTERUS AND ADJACENT SEGMENT OF THE RECTUM IN SAGITTAL SECTION. The cervix is the seat of adenomyomatous disease which spread to and invaded the wall of the rectum The clinical appearances were so like cancer that the uterus and rectum were excised. (*After Cuthbert Lockyer.*)

many cases in which the uterus has been removed for so-called adeno-carcinoma of the body of the uterus and the patients remained free from recurrence, the disease was really adenomyoma of the corporeal endometrium.

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of the uterus had displayed invasiveness which is such a common feature of cancer. It is important to emphasize this aspect of the disease because some examples have been described as cancer of the uterus. The importance of surgeons being aware of this is illustrated by a remarkable case recorded by Cuthbert Lockyer :

A woman, aged 35, had a hard mass in the posterior vaginal fornix, fixed to the supravaginal portion of the neck of the uterus and adherent to the pelvic floor. No definite diagnosis appeared to be possible, and, as the poor woman's health was seriously impaired, total hysterectomy was performed. In the course of the operation the neck of the uterus

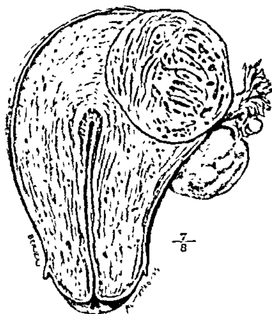


Fig. 59. Uterus in Sagittal Section. Showing a localised patch of adenomyoma resembling a subserous fibroid : it had invaded the rectum. From a primipara aged 35.

and the rectum were found so firmly fused together, that the implicated section of the rectum was removed with the uterus, and the proximal end of the divided bowel secured to an opening made in the left flank (inguinal colotomy)

When the excised parts were examined, the new growth, which implicated the uterus and the rectum, displayed the microscopic structure of adenomyoma. The pathological features of this rare condition are made easily intelligible by Lockyer's excellent illustrations. It is startling to find adenomyomatous changes involving the supravaginal segment of the uterus and extending into the pelvic connective tissue like malignant disease The specimen represented in Fig. 60 shows also that the disease may perforate the serous covering and invade adjacent

additional factor in promoting domestic bliss. The question of nubility is interesting; I am able to state that women who have had subtotal hysterectomy performed, with conservation of one ovary, have married and lived happily with their husbands; and I am of opinion that the preservation of the vaginal segment of the neck of the uterus is an important factor, as it leaves the vagina intact, and though such women are sterile, they are certainly nubile.

Without overstating the case, it may be said that a belated ovary is a very precious possession to a woman under forty years of age, whether she be married or single.

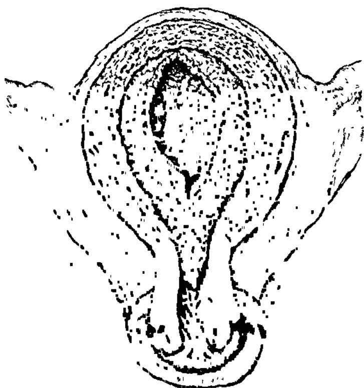


Fig. 61. Uterus with the Decidua in Situ. The parts of the uterus occupied by the decidua represent the menstrual area of the uterus.

In regard to the fate of such ovaries, in the present condition of our knowledge it may be stated that :—

In a woman under the fortieth year of life, a belated ovary remains active and discharges ova.

An ovary belated after the fortieth year of life atrophies, and menopause symptoms will often ensue in the course of a few months after the operation. The retention of an ovary minimizes the menopause disturbances, and they are never so acute and prominent under these conditions as they are when an acute menopause is induced by the sudden and complete removal of all ovarian tissue. Some experienced observers maintain that an ovary is a valuable possession to any woman who menstruates, even at the age of fifty years, the persistence of menstruation being obtrusive evidence that this gland is functional. Experimental evidence, obtained from rabbits, proves that the removal of the whole uterus has no deterrent effect on ovulation, and *it does not* prevent the occurrence of œstrus and ovulation at periodically recurring intervals. There is no necessity to appeal to experiments on animals in

THE FATE AND VALUE OF BELATED OVARIES

The only improvement of any importance made in Baer's operation of subtotal hysterectomy concerns the ovaries. These Baer removed with the uterine tubes, but in 1897 I advocated, at the Obstetrical Society, London, that they were of great value to the patient, and pointed out that their conservation, when healthy, spared the patient the annoyance of that curious vaso-motor phenomenon, known to women as 'flushings', which is the only obtrusive sign of the menopause.

It is now admitted by those surgeons in London who have had much experience of hysterectomy for fibroids, that the immediate results of *preserving at least one healthy ovary in this operation are admirable, especially in women under forty years of age, for the retention of an* ovary is of striking value 'in warding off the severity of an artificial menopause' (Crewdson Thomas).

Although I have left one or both ovaries in the performance of abdominal hysterectomy for fibroids in more than 300 patients, in only two instances have I found anything detrimental in the practice. In these two patients it was necessary to remove one of the ovaries Since 1906 I have modified the method by leaving only one ovary, even when both were healthy, and find that the immediate good consequences of the operation are in no way impaired. There is reason to believe that whatever good effects follow the practice of leaving a belated ovary (that is, an ovary divorced from the uterus and left in the pelvis), they are temporary, for in the course of a few years the ovarian tissue disappears and the patients experience the usual symptoms of the menopause. It is possible that the rate of atrophy of the secreting tissue of a belated ovary depends on the age at which a patient is submitted to hysterectomy.

In 1898 I performed subtotal hysterectomy on a woman, thirty-one years of age, for fibroids, conserving the right ovary. Nine years later (1907) I operated again for intestinal obstruction, and found this ovary healthy and functional, for a ripe corpus luteum was visible on its surface. Even a portion of an ovary, if it contain follicles, will maintain menstruation

In performing abdominal hysterectomy for fibroids, there are three points which require consideration in relation to the subsequent comfort of the patient, and they depend mainly on the conservation of a healthy ovary. These three points relate to: (*a*) the patient's comfort in securing freedom from flushings; (*b*) if she be married, her marital relations; and (*c*) if single, her nubility

In regard to marital relations in women with a belated ovary, nothing trustworthy is forthcoming, but I believe the retention of an ovary is an

SECTION VI

OPERATIONS FOR MALIGNANT DISEASE OF THE UTERUS AND CERVIX

BY

VICTOR BONNEY, M.S. (Lond.), F.R.C.S. (Eng.)

Assistant Gynæcological Surgeon, Middlesex Hospital;
Surgeon, Chelsea Hospital for Women

this matter, as clinical observations on women are most eloquent in proclaiming the great value of a conserved ovary when the uterus is removed on account of troublesome and dangerous fibroids.

In reference to the value of ovarian tissue after hysterectomy for fibroids, attention should be drawn to a modification of this operation known as the Abel-Zweifel method, by which a small segment of the menstrual area of the uterus is left as well as one or both ovaries: this permits menstruation to continue in a subdued form.

Doran has particularly studied this method and practised it, but I cannot express any opinion as to its value, never having had the courage to perform it.

My aim in performing hysterectomy for fibroids is to abolish as completely as possible the menstrual area of the uterus (Fig. 61), and up to the present my efforts have been successful, and I have no complaint from any patient that this disagreeable phenomenon has manifested itself, although I have been at great pains by my own exertions, as well as by the kind efforts of those who have been associated with me in my hospital work, to keep in touch with women who have been so unlucky as to require such a serious operation as the removal of the uterus.

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CHAPTER I

OPERATIONS FOR CARCINOMA OF THE CERVIX UTERI

THE surgical extirpation of carcinoma of the cervix may be attempted either by the abdominal or vaginal route, or by both routes combined.

Before describing the technique of these operations it will be pertinent briefly to outline the pathological and anatomical facts that determine the principles of their performance.

Carcinoma of the cervix is of the squamous-cell variety in 98 % of the cases, and is preceded in all of them by chronic cervicitis and cervical erosion.

In the remaining 2 % the growth is of the columnar-cell glandular variety, and originates in the racemose cervical glands.

As in all varieties of carcinoma, that of the cervix spreads by two processes (1) infiltration, and (2) permeation.

Infiltration is going on around the whole periphery of the growth. It consists in a slow absorption and replacement of the normal tissues of the part by the carcinoma cells.

Permeation is a much more rapid process. It consists of entrance into and progression along trunk lymph-channels by the carcinoma cells, and it only occurs along certain definite tracts.

The vexed question of vascular dissemination of carcinoma need not be considered when dealing with growth arising in the cervix, since, like the squamous-cell variety occurring elsewhere, metastases possibly arising by this method of conveyance are extremely rare.

Growth by infiltration takes place downwards into the vagina, forwards into the bladder, backwards towards the rectum and the peritoneum of Douglas's pouch, and laterally into the paracervical tissue.

Lymphatic permeation takes place chiefly along two tracts. The first of these, the commoner and the more important, is laterally into the tissue immediately underlying the ureter and forming the base of the broad ligament. The lymph-vessels, in their course through this tissue, pass through several aberrant lymph glands, and finally reach the wall of the pelvis. Here they communicate with a group of lymph glands lying in the obturator fossa, and from thence mount the pelvic side wall to join the external iliac glands lying on the inner side of the external iliac vein, and between the hypogastric and the external iliac

The glands commonly first affected are those lying in the obturator fossa and along the external and common iliac vessels.

To thus widely remove the diseased aréa it is absolutely necessary to isolate and displace the ureters.

TECHNIQUE OF THE OPERATION

Previous preparation of the patient. As a large number of the patients are extremely enfeebled it is important to endeavour beforehand to improve their general condition. This should be attempted by keeping them in bed for a week or more before the operation, during which time they should be fed up and tonics (especially strychnine) and a little wine given.

They should be given a couple of warm baths a day, special attention being directed to cleansing the external genitals.

If the discharge from the cervical growth is very foul, it may be advisable first to erase it thoroughly by means of the curette and cautery, but if this practice is followed, several weeks should be allowed to elapse between the preliminary operation and the major procedure, for it takes this time for the sloughs caused by the cautery to separate and the surface to become clean.

If it is not deemed advisable to wait so long, then the preliminary cauterization should immediately precede the extirpation.

Scraping and cauterization have, however, this disadvantage, that they may so thin the cervical tissues that the latter readily tear during removal.

For this reason it is better in cases without foul discharge to dispense with such measures and to rely on the application of strong antiseptics to the vagina and cervix immediately before the operation.

Where the growth is large and fungating it should be cut away with scissors, otherwise its bulk will necessitate a very large amount of the vagina being removed in order completely to surround it.

Position of the patient for the operation. The Trendelenburg position is required, but an extreme tilt should be avoided, or at all events maintained for as short a time as possible. There can be no doubt that where shock is marked the lowering of the patient from an extremely tilted position to the horizontal is followed by an immediate diminution in the force of the pulse.

The anæsthetic. A good anæsthetist is of the greatest importance, because the fullest relaxation of the abdominal wall is desirable. On the whole, chloroform is the best anæsthetic because it tends to minimize the bleeding during the operation, which is undoubtedly the most important cause of the post-operative shock. On the Continent spinal anæsthesia is

arteries. From thence the tract continues upwards through the common iliac glands to the aortic glands.

The second tract proceeds backwards by way of the utero-sacral ligaments, and passes out of the pelvis in the interval between the psoas muscle and the last lumbar vertebra to reach the aortic glands, and join with the first tract.

In order, therefore, to fulfil the modern tenets governing the surgery of malignant disease, it is necessary so to plan the excision that while the line of section at all points lies well outside the area of growth by infiltration, it shall be extended in certain directions so as to ablate the areas of growth by lymphatic permeation.

From the point of view of operative removal the cervix is in fact a favourable site for carcinoma, for it has been shown by Archibald Leitch that of persons dying of the disease, only 45 % exhibit metastatic growths on autopsy, and in the larger proportion of these the secondaries are limited to glandular deposits.

These findings agree with the results of operative experience. In a series of over one hundred and fifty cases of radical abdominal extirpation performed by the writer of this article and Comyns Berkeley, only fifty-six (37 %) exhibited carcinoma of the regional glands.

The comparative rarity with which secondary growths are present in carcinoma of the cervix is in striking contrast to carcinoma of the breast, in which disease only 6·5 % of those dying of it are found to be free of metastases.

It is from the anatomical standpoint that the aspect of carcinoma of the cervix is seen to be a grave one, for on account of the proximity of the cervix to the bladder, ureters, great vessels, and rectum, radical extirpation of a growth in this situation is a very formidable operation.

It is further to be noted that while the difficulties increase with the advancement of the growth, and the stamina of the patient diminishes, the necessity for an extensive radical procedure becomes more imperative. Thence arises the considerable primary mortality rate which attends the operation when applied to advanced cases.

RADICAL EXTIRPATION BY THE ABDOMINAL ROUTE (WERTHEIM'S OPERATION)

The modern radical operation by the abdominal route consists in the removal of the uterus and appendages and an amount of healthy vagina sufficient when clamped to form a bag which encapsules the diseased cervix. Together with these parts the para-metric and para-vaginal cellular tissue is removed with as many of the regional glands as may be feasible.

An alternative, which I have lately adopted in very stout patients, is to eventrate the intestines and wrap them up in a towel moistened with warm saline solution. Though at first sight this proceeding would appear likely to be productive of shock, it does not in practice have any such effect, while it certainly makes the operator's task much easier.

Investigation of the conditions. The degree of advancement of the growth should now be investigated by handling the parts. Involvement of the bladder is indicated by a puckered indrawing of the peritoneum at the bottom of the utero-vesical pouch. The glands along the iliac vessels and aorta should be palpated.

In most advanced cases it will be found that bilateral salpingitis is present, often with many dense adhesions. The tubes or ovaries may have suppurated. Pyometra is another common accompaniment. The uterus when thus affected is enlarged and soft, and there is dilatation of the capillary vessels over its surface.

The operator will now be in a much improved position to decide whether the extirpation is feasible or not; and if the latter, then the abdominal wound should be immediately closed.

In some cases, however, he will still be in doubt, and he should then proceed to find out if the bladder is separable; for if this is the case, the operation should be able to be completed. On the other hand, dense adhesion, which will necessitate excision of part of the bladder, as a rule contra-indicates any further measures.

Division of the broad ligaments. Ligatures are now placed upon the ovario-pelvic and round ligaments of either side as far out as possible, and a pressure forceps having been temporarily placed on the ovarian vessels as they enter the uterus, the broad ligaments are divided immediately inside the ligatures, and the incisions on either side are continued forwards through the peritoneum to meet in front of the uterus. To do this the peritoneum covering the front of the cervix should be separated first by the finger, and the division should be made at the upper limit of the loose attachment so as to ensure a maximum size of the anterior peritoneal flap.

The two appendages are thus freed except at their uterine attachments. The forceps holding the ovarian vessels on either side should now be replaced by ligatures tied round the whole remaining attachments. The ends of these ligatures should be left long to act as tractors for the uterus.

Beginning the separation of the bladder. The separation of the bladder from the supravaginal cervix should now be begun.

This is a most important step, for on its possibility the indication for proceeding with the operation rests.

Where there is no morbid adhesion the separation is easily effected

extensively used. Its drawback is that the Trendelenburg tilt is incompatible with it, that the anæsthesia may not last long enough to enable the operator to complete the operation without recourse to chloroform or ether, and that to nervous patients consciousness is a severe mental trial.

Preparation of the vagina. Immediately after the patient has been anæsthetized, the vagina should be thoroughly washed out with soap and water and then irrigated with a solution of 1 in 500 biniodide of mercury in water.

All excess of this having been mopped out, the canal should be packed with gauze soaked in 5 per cent. nitrate of silver solution. The end of the gauze hanging out of the vagina should be left long for convenience of subsequent removal.

(See also remarks on cauterization, p. 151).

The abdominal incision. This should be of ample length. In all cases it should extend to the umbilicus and in obese patients an inch or more above it.

Preparation of the wound edges. It is most important to guard against infection of the edges of the abdominal wound both by cancer cells and by organisms present in the vagina. The first of these objects is achieved by the encapsulization of the growth in the manner presently to be described. The second event, however, is more difficult of prevention, because the vaginal surface is brought into continuity with the operation area directly the uterus has been removed.

Transference of organisms present in the vagina (and derived from the growth) is avoided, firstly, by the thorough cleansing of that canal which has already been described as a preliminary step. In spite, however, of the most painstaking care, absolute sterilization of the vaginal surface is impossible and it is, therefore, most advisable to cover the edges of the abdominal wound with some impervious substance such as thin sheet rubber. This is folded over the wound edges and held in place by a self-retaining retractor, the best of which for the purpose is Berkeley's. Not only does this device save the abdominal wound from the possibility of infection from the cervix but it also excludes the abdominal skin from the operation area.

Exposure of the pelvic cavity. The Trendelenburg tilt coupled with wide opening out of the abdominal wound by a self-retaining retractor suffices in thin patients to give a good view of the pelvic cavity.

In stout patients, however, the intestines obscure the operator's view. In such cases they may be dammed back by the insertion of a large abdominal swab. This method has, however, the disadvantage of thrusting the mass of intestines against the diaphragm, and by hindering the patient's respiration making the anæsthetist's task much more difficult.

If it cannot even thus be detected the operator should proceed to the next step of the operation.

Ligature of the uterine artery. The uterine artery should be sought for, as it runs from the pelvic side wall to the side of the uterus. This is done by gently separating the loose cellular tissue of the base of the broad ligament until the vessel is seen.

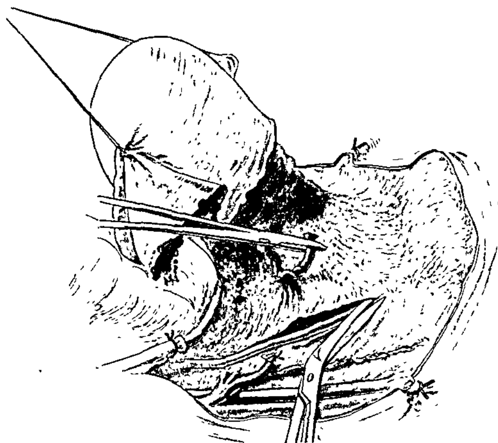


FIG. 63. RADICAL EXTIRPATION OF THE UTERUS BY THE ABDOMINAL ROUTE. *Opening up the ureteric canal.* (Semi-diagrammatic.)

It is here to be remembered that this artery usually comes off from the hypogastric artery as a common trunk with the umbilical artery, leaving which it runs inwards at right angles to the side of the uterus, crossing the ureter in its path.

Occasionally, however, it arises direct from the hypogastric artery, in which case it takes an oblique course to the uterus, almost parallel to the ureter, but above it, and lying on the same sheet of peritoneum.

The artery having been found, it should be divided between two pairs of pressure forceps, as far outward as possible. The proximal end

by a few snips with the scissors and pressure from a gauze swab, but where it is otherwise very careful dissection is required lest the bladder be opened.

When it is obvious that the separation can be effected, the operator should for the present desist, because complete separation entails a good deal of oozing which is better left till a later stage.

Identification of the ureter. The ureter is now sought for on one side

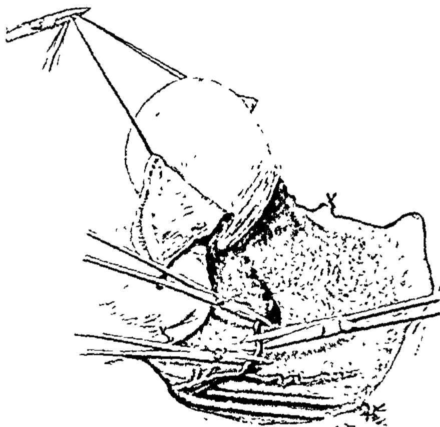


FIG. 62 RADICAL EXTIRPATION OF THE UTERUS BY THE ABDOMINAL ROUTE. *Division of the uterine artery.* (Semi-diagrammatic.)

as it runs downwards clinging to the peritoneum covering the back of the broad ligament and the pelvic side wall.

It may be clearly seen by pushing the peritoneum in towards the median plane, a proceeding that is made easier by dividing this membrane for about an inch upwards outside the ligature previously placed on the ovario-pelvic ligament.

In stout patients it may be difficult to see, in which case it should be felt for by the finger and thumb, feeling like a cord the size of a goose quill, which slips under the finger.

If it cannot even thus be detected the operator should proceed to the next step of the operation.

Ligature of the uterine artery. The uterine artery should be sought for, as it runs from the pelvic side wall to the side of the uterus. This is done by gently separating the loose cellular tissue of the base of the broad ligament until the vessel is seen.

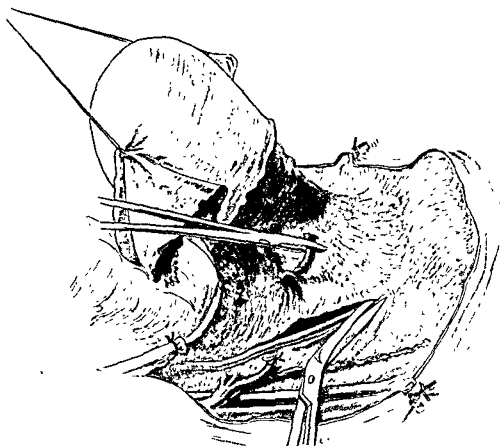


FIG. 63. RADICAL EXTIRPATION OF THE UTERUS BY THE ABDOMINAL ROUTE. *Opening up the ureteric canal.* (Semi-diagrammatic)

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The artery having been found, it should be divided between two pairs of pressure forceps, as far outward as possible. The proximal end

should then be immediately ligatured. By means of the forceps holding the distal end the artery inside of this should be separated backwards towards the uterus, when the ureter will be disclosed as it passes underneath it (Fig. 62).

This is an excellent method of finding the ureter in difficult cases. The distal end should now be ligatured.

The uterine vein is often included in the forceps that seize the artery. In other cases it requires separate treatment in the same way.

Not infrequently it passes under the ureter instead of over it like the artery.

Isolation of the ureter. The ureter is now separated from its bed at a point slightly above where it passes under the uterine artery.

In its further course downwards it will now be seen to pass into a mass of tissue connecting the cervix with the sides of the bladder. Through this it travels in the 'ureteral canal', a space through which it is easy to insinuate the finger in simple cases, but which scarcely exists where the para-cervical and para-vaginal tissues are thickened either by cancerous infiltration or chronic cellulitis.

The ureteral canal is best opened by means of angular probe-pointed scissors passed along it in the line of the ureter (Fig. 63).

Several small vessels crossing from the bladder to the cervix will be divided in this proceeding.

The ureter having thus been laid bare up to its entrance into the bladder, should be lifted out of its bed by gentle dissection, until it is quite free. Several large veins are usually opened in the floor of the 'ureteral canal' while effecting this, and these must be secured.

The difficulty of isolating the ureter varies in different cases. In advanced cases it most commonly lies in a groove on the side of the growth from which it will have to be displaced.

Less frequently it actually runs through the growth. These are very bad cases, and the operator may decide to abandon further attempts to remove the growth, but if it appears feasible on other counts to proceed with the operation, the whole mass of infiltrated tissue should be resected together with the involved segment of the ureter, and the upper cut end of this structure subsequently implanted into the bladder.

Treatment of the uterine artery and ureter of the opposite side. Both uterine arteries may be secured before either ureter is isolated, or one side may be completed before the other is touched.

Separation of the rectum. The uterus having been drawn forwards, the peritoneum at the bottom of Douglas's pouch is picked up with forceps and divided with the scissors. The finger then seeks for the cleavage

plane that separates the vaginal and rectal walls, and when this is found, the two canals are parted from one another for the distance the surgeon thinks proper. There should be little or no bleeding during this step if the right plane is arrived at, and if no morbid adhesion exists (Fig 64).

Completion of the separation of the bladder. The separation of the bladder is now completed. The extent to which this is desirable varies in different cases, but it should certainly be not less than one and a quarter inches below the lowest level of the growth.

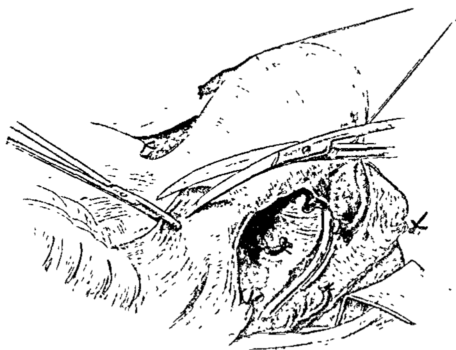


FIG. 64. RADICAL EXTIRPATION BY THE ABDOMINAL ROUTE. *First step in the separation of the rectum from the vagina.* (Semi-diagrammatic.)

It is effected by cautious snipping with scissors, and gentle pushing down by swab and finger pressure. There is often considerable oozing, especially from the more lateral aspects of the anterior vaginal wall.

The insertion of a broad retractor to hold back the bladder above the line of separation is very useful.

Division of the utero-sacral ligaments. When the bladder has been separated the uterus is once more held forwards and the peritoneum that intervenes between the opened broad ligaments and the aperture in the bottom of Douglas's pouch is divided on either side, the tissue of the utero-sacral ligaments not being included.

The operator should now assure himself that the rectum is completely separated, especially on the left side, where it is apt to adhere to the utero-sacral ligament. Long pressure-forceps are then placed upon

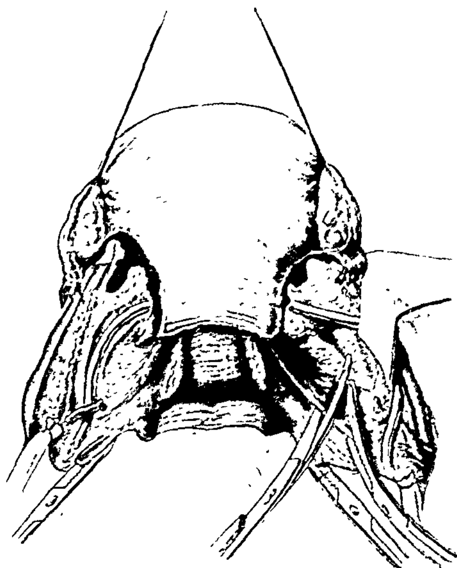


Fig. 65. Radical Extirpation by the Abdominal Route. *Division of the lateral cervico-pelvic ligaments* The ureter is held aside. The utero-sacral ligaments are already divided. (Semi-diagrammatic)

the utero-sacral ligaments of either side as far back as possible and the ligaments are divided in front of this.

Division of the lateral cervico-pelvic ligaments. It will now be found that the uterus is still held down by a couple of broad fan-shaped bands running laterally from the cervix and vaginal vault to the side-wall of the pelvis and pelvic floor. These are the lateral cervico-pelvic or 'Mackenrodt's' ligaments.

They are to be divided after clamping them as far out as possible by means of two or more angular or curved pressure-forceps, on either side (Fig. 65).

Directly they are divided the uterus becomes much more mobile, remaining attached merely by the vagina.

Division of the vagina. The gauze previously placed in the vagina is now withdrawn and the T-shaped vaginal clamp illustrated is applied to the vagina just above the point where the bladder is attached.

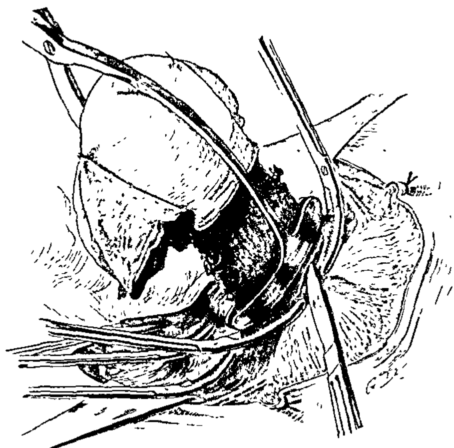


FIG. 66. RADICAL EXTIRPATION BY THE ABDOMINAL ROUTE *Application of the T-clamp and division of the vagina.* (Semi-diagrammatic.)

Before doing this it is advisable to apply to either side of the vagina below the clamp a right-angled short-bladed pressure-forceps, so as to control the lateral vaginal vessels. The vagina should now, if possible, be mopped dry by an assistant, and the operator then proceeds to divide it with a scalpel immediately below the T-clamp and above the right-angled forceps holding the lateral angles (Fig 66).

Applying the ligatures. The various pressure-forceps holding the divided ligaments and the lateral vaginal angles are now replaced by ligatures. Of these, by far the most important are those that secure the

vaginal angles and the vessels in them. If this is not done thoroughly very troublesome oozing will occur.

The application of ligatures deep down in the pelvis is facilitated by the use of Worrall's notched needle.

Removal of the pelvic glands and lymphatic tracts. Though in theory it would be best to remove the regional glands and lymphatic tracts in one piece with the primary growth, in practice it is impossible. The

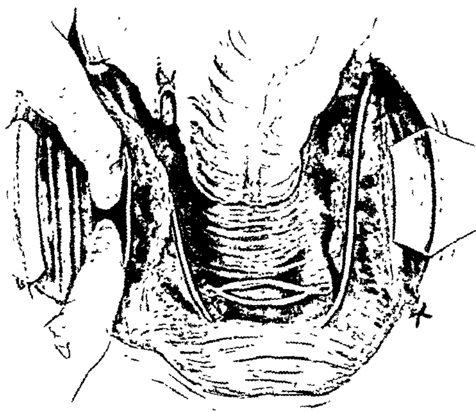


Fig. 67. Radical Extirpation by the Abdominal Route. *Separation of the tissue in the obturator fossa.* Note the obturator nerve. (Semi-diagrammatic.)

removal of the glands should, therefore, be made the second stage of the operation.

Many operators do not remove the glands at all, holding the case inoperable if they be found enlarged.

Others, amongst whom Wertheim himself is numbered, content themselves with removing them only if they be enlarged.

The author is, however, of opinion that logically the operation is incomplete without the removal of, at least, the tract of most frequent lymphatic permeation, and both he and his colleague Comyns Berkeley have systematically carried it out.

There can be no doubt that this step materially increases the severity of the operation, but, on the other hand, it enables cases to be successfully dealt with that, by less radical measures, it would be useless to operate upon.

The ablation desired is that of the main lymphatic tracts already described (see p. 149).

The operator should begin above. When the glands along the external iliac vessels are not enlarged it will suffice to begin at the bifurcation of

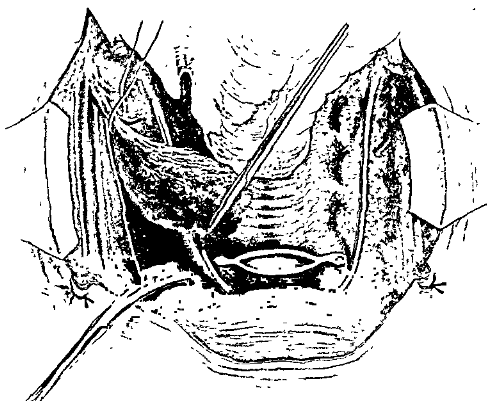


FIG. 68. RADICAL EXTIRPATION BY THE ABDOMINAL ROUTE. *Removal of the tissue occupying the obturator fossa.* The ligature is placed round the anterior trunk of the hypogastric artery. (Semi-diagrammatic.)

the common iliac artery; when they are enlarged it is necessary to start just below the bifurcation of the aorta or even higher.

The vessels having been exposed by reflecting the peritoneum, the connective-tissue sheath covering them should be divided on the outer side of the artery and then reflected immediately off the vessels. In favourable cases it will be found that the whole sheath can be separated *en masse* with its contained lymph glands. In advanced cases it is common to find one or more carcinomatous glands adherent to the external iliac vein, from which they should be separated with the greatest

care. The sheet of connective tissue will now remain attached only along its inner side where it is continuous with the mass of tissue occupying the obturator fossa.

This mass has at its upper edge the obliterated hypogastric or umbilical artery.

The finger is now gently insinuated between this vessel and the side wall of the pelvis and the mass of tissue occupying the obturator fossa with the contained obturator glands is pushed inwards (Fig. 67).

In this manœuvre the obturator nerve is included in the mass, from which it should be separated unless it is adherent to cancerous glands there.

The obturator vessels cling to the bony wall of the pelvis and are not endangered.

The surgeon still working with his finger separates the cellulo-fatty tissue from the pelvic floor below so that it only remains attached by its upper and lower ends.

The lower end is clamped just above the lateral angle of the bladder, and divided above the clamp, when it will be found that the whole mass can be reflected upwards pivoted on the anterior trunk of the hypogastric artery.

A stout ligature having been made to encircle this pedicle, the mass is cut away, carrying with it the original ligature on the uterine artery, the hypogastric artery, the obturator and hypogastric glands, and a considerable amount of cellulo-fatty tissue (Fig. 68).

The tissue adjacent on the side of the cervix and vagina is thus cleared away down to the bony pelvic side wall.

In carrying out this proceeding great care must be taken that the ureter is not inadvertently included in the parts removed.

Suture of the peritoneal floor. All oozing having been stopped, a small piece of gauze is packed into the cavity and one end pushed down the vagina. The anterior cut edge of the peritoneum is now sutured to the posterior cut edges, beginning at the site of the ligature on one ovario-pelvic ligament, and continuing across to the same point on the other side.

A new pelvic floor composed of peritoneum is thus formed.

Closure of the parietal wound. The parietal wound must now be closed. Inasmuch as the healing powers of these patients are below the normal, it is well to use a few through-and-through sutures to supplement the buried stitches.

ULTIMATE RESULTS OF THE OPERATION

As might be expected from the facts of pathology previously quoted, the prospects of permanent cure in those surviving the operation are good.

Thus Wertheim, the apostle of the abdominal operation, had 53 per cent. of his cases that recovered from the operation alive after five years.

In this country these radical procedures have not been practised long enough to afford statistics of anything like the value of those of Wertheim and some of the Continental surgeons. It may, however, be assumed that the results of British surgeons will not be found inferior.

In estimating the value of the operation in the hands of any particular surgeon, it is absolutely necessary to consider not only the number of deaths from the operation and the percentage of patients surviving it after five years, but also the operability-rate, i.e. the proportion of patients operated upon out of those presenting themselves for treatment.

Thus Wertheim's first 250 operations were selected out of 607 patients attending his clinic—an operability-rate of 41 %.

Of these 250 patients, 106 were alive and well at the end of five years, that is to say, out of 607 patients presenting themselves with carcinoma of the cervix, 106 were cured of the disease. This equals 18·4 %, and the figure thus arrived at is termed the actual achievement or absolute efficacy-rate, and is the only real test of the value of any individual surgeon's results.

Although, as it has been said, the operation has been performed too short a time in this country to allow of the ultimate results being forthcoming, the following figures of the author and his colleague, Comyns Berkeley, are of interest.

Up to July 1910, we had performed 71 operations selected from 112 patients seen—an operability-rate of 63 %. Of the 71 patients operated on, 16 died of the operation (a mortality of 22 %).

At the present date (July 1913), of the 55 patients who survived the operation, 23 have died, or are dying of recurrent growth, 2 have died of other disease, 2 have disappeared (known to be alive over three years), and 28 remain alive and free of recurrence.

In 5 out of these 28 patients the glands removed at the operation were microscopically shown to be carcinomatous.

The immediate mortality. The immediate mortality of the operation varies according to the stage of the disease, the physique of the patient, and the thoroughness with which it is carried out.

Thus, when the growth is limited to the cervix, the task set the operator and the demands made on the patient's resisting powers are far lighter than when it has extended into the bladder or parametrium, or has involved the ureters.

In elderly persons the risk is much increased, especially in patients over 60 years of age. In obese patients the difficulties of the procedure are greatly increased. Many of the sufferers from this disease are in

care. The sheet of connective tissue will now remain attached only along its inner side where it is continuous with the mass of tissue occupying the obturator fossa.

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The finger is now gently insinuated between this vessel and the side wall of the pelvis and the mass of tissue occupying the obturator fossa with the contained obturator glands is pushed inwards (Fig. 67).

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In carrying out this proceeding great care must be taken that the ureter is not inadvertently included in the parts removed.

Suture of the peritoneal floor. All oozing having been stopped, a small piece of gauze is packed into the cavity and one end pushed down the vagina. The anterior cut edge of the peritoneum is now sutured to the posterior cut edges, beginning at the site of the ligature on one ovario-pelvic ligament, and continuing across to the same point on the other side.

A new pelvic floor composed of peritoneum is thus formed.

Closure of the parietal wound. The parietal wound must now be closed. Inasmuch as the healing powers of these patients are below the normal, it is well to use a few through-and-through sutures to supplement the buried stitches.

ULTIMATE RESULTS OF THE OPERATION

As might be expected from the facts of pathology previously quoted, the prospects of permanent cure in those surviving the operation are good.

Thus Wertheim, the apostle of the abdominal operation, had 53 per cent. of his cases that recovered from the operation alive after five years.

In this country these radical procedures have not been practised long enough to afford statistics of anything like the value of those of Wertheim and some of the Continental surgeons. It may, however, be assumed that the results of British surgeons will not be found inferior.

In estimating the value of the operation in the hands of any particular surgeon, it is absolutely necessary to consider not only the number of deaths from the operation and the percentage of patients surviving it after five years, but also the operability-rate, i.e. the proportion of patients operated upon out of those presenting themselves for treatment.

Thus Wertheim's first 250 operations were selected out of 607 patients attending his clinic—an operability-rate of 41 %.

Of these 250 patients, 106 were alive and well at the end of five years, that is to say, out of 607 patients presenting themselves with carcinoma of the cervix, 106 were cured of the disease. This equals 18·4 %, and the figure thus arrived at is termed the actual achievement or absolute efficacy-rate, and is the only real test of the value of any individual surgeon's results.

Although, as it has been said, the operation has been performed too short a time in this country to allow of the ultimate results being forthcoming, the following figures of the author and his colleague, Comyns Berkeley, are of interest.

Up to July 1910, we had performed 71 operations selected from 112 patients seen—an operability-rate of 63 %. Of the 71 patients operated on, 16 died of the operation (a mortality of 22 %).

At the present date (July 1913), of the 55 patients who survived the operation, 23 have died, or are dying of recurrent growth, 2 have died of other disease, 2 have disappeared (known to be alive over three years), and 28 remain alive and free of recurrence.

In 5 out of these 28 patients the glands removed at the operation were microscopically shown to be carcinomatous.

The immediate mortality. The immediate mortality of the operation varies according to the stage of the disease, the physique of the patient, and the thoroughness with which it is carried out.

Thus, when the growth is limited to the cervix, the task set the operator and the demands made on the patient's resisting powers are far lighter than when it has extended into the bladder or parametrium, or has involved the ureters.

In elderly persons the risk is much increased, especially in patients over 60 years of age. In obese patients the difficulties of the procedure are greatly increased. Many of the sufferers from this disease are in

care. The sheet of connective tissue will now remain attached only along its inner side where it is continuous with the mass of tissue occupying the obturator fossa.

This mass has at its upper edge the obliterated hypogastric or umbilical artery.

The finger is now gently insinuated between this vessel and the side wall of the pelvis and the mass of tissue occupying the obturator fossa with the contained obturator glands is pushed inwards (Fig. 67).

In this manœuvre the obturator nerve is included in the mass, from which it should be separated unless it is adherent to cancerous glands there.

The obturator vessels cling to the bony wall of the pelvis and are not endangered.

The surgeon still working with his finger separates the cellulo-fatty tissue from the pelvic floor below so that it only remains attached by its upper and lower ends.

The lower end is clamped just above the lateral angle of the bladder, and divided above the clamp, when it will be found that the whole mass can be reflected upwards pivoted on the anterior trunk of the hypogastric artery.

A stout ligature having been made to encircle this pedicle, the mass is cut away, carrying with it the original ligature on the uterine artery, the hypogastric artery, the obturator and hypogastric glands, and a considerable amount of cellulo-fatty tissue (Fig. 68).

The tissue adjacent on the side of the cervix and vagina is thus cleared away down to the bony pelvic side wall.

In carrying out this proceeding great care must be taken that the ureter is not inadvertently included in the parts removed.

Suture of the peritoneal floor. All oozing having been stopped, a small piece of gauze is packed into the cavity and one end pushed down the vagina. The anterior cut edge of the peritoneum is now sutured to the posterior cut edges, beginning at the site of the ligature on one ovario-pelvic ligament, and continuing across to the same point on the other side.

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Closure of the parietal wound. The parietal wound must now be closed. Inasmuch as the healing powers of these patients are below the normal, it is well to use a few through-and-through sutures to supplement the buried stitches.

ULTIMATE RESULTS OF THE OPERATION

As might be expected from the facts of pathology previously quoted, the prospects of permanent cure in those surviving the operation are good.

beneficial as far as shock is concerned, has, however, in the experience of the author, increased the loss of blood during the operation, and therefore it should be used with much caution and not in any case at the outset of the proceeding.

Injury to the bladder. With the greatest care the bladder will sometimes be opened during its separation. The event is a misfortune because secure suture is very difficult owing to the position of the hole and the attenuated condition of the bladder wall.

Moreover, since more or less septic infection of the large cavity left by the operation is usual, the chances of the sutures holding are problematical and a fistula is very likely to result.

In some cases it may be justifiable to cut away a piece of adherent bladder, but it is a proceeding not often advisable.

Quite apart from actual opening of the viscus during the operation, sloughing of the exposed and thinned bladder base sometimes occurs during convalescence. Easily absorbable catgut should always be employed for suture of the bladder. Permanent sutures lead to calculus formation.

Injury to the ureters. A segment of the ureter may be deliberately excised during the operation. If this is done, or if the ureter is accidentally divided, the upper cut end should be implanted into the bladder (see Vol. III). The expedient of simply tying it is a bad one.

Ureteral grafting, though often successful, is apt to be followed by a ureteral fistula for the same reason that suture of the bladder often fails.

Where the ureter is cut high up the bladder will have to be displaced to allow of a junction being made.

Sloughing of the ureter some days after the operation is the commonest cause of ureteral fistula. It is often associated with pyelitis and high fever.

Some of these fistulæ close spontaneously after weeks or months, but others are permanent.

The problem of how to deal with one of these latter is difficult—certainly no operation should be attempted for a year. The choice then lies between nephrectomy or an attempt to graft the ureter into the bladder. Where the opening is situated only a short distance from the bladder (as proved by the attempted passage of the ureteral catheter) it would be better to attempt the latter proceeding provided the bladder and kidney were healthy. Easily absorbable catgut should be used, for even the finest thread or silk may be the origin of a calculus.

Injury to the rectum and rectal fistula. Opening the rectum whilst separating it from the vagina is a serious disaster. The accurate closure of such a hole is difficult, the sutures are very apt not to hold, and severe infection of the operation area is almost certain.

a miserable state of health when they present themselves. This is due partly to the effect of the growth, and partly to the fact that carcinoma of the cervix is undoubtedly much commoner in the neglected and ill-nourished poor than in the well-to-do.

In general it may be said that as regards physique these patients, as a class, are probably the most unsatisfactory of any that come before the surgeon. It is therefore obvious that a general mortality-rate cannot be applied to individual cases, each being a law unto itself in this regard.

Speaking broadly, however, it may be stated that the death-rate in early cases is not much above 5 %, in moderately advanced cases probably about 15 %, and in advanced cases 25 %.

CAUSES OF DEATH AND COMPLICATIONS OF THE OPERATION

Shock. The shock caused by the operation is considerable, and is the chief cause of death. It is greater in proportion to the difficulty and duration of the proceeding.

The time taken varies in different cases. Thus, in the hands of the author it has varied as a rule between one hour and one hour and thirty minutes. It is a matter of real importance to be speedy in its performance, especially in elderly patients. The shock, however, is out of all proportion to the time taken, and no doubt chiefly depends on the extensive 'tissue and sympathetic injury' that the procedure necessitates.

The operation as has been described is by far the most difficult of any recognized surgical procedure, not excepting abdomino-perineal excision of the rectum, and it is desirable that both operator and assistant should be experts if the best results are to be obtained. In patients over 60 years of age the chances of death from shock are considerable.

Hæmorrhage. The operation involves considerable loss of blood by reason of the persistent oozing that characterizes most cases.

From this point of view young plethoric patients are worse subjects for it than the attenuated and anæmic.

Chloroform is preferable to ether as an anæsthetic, because the latter increases the bleeding. In particular, cyanosis of the patient should be avoided.

The principal loss of blood is by venous oozing. It is for this reason that ligature of the hypogastric arteries as a preliminary step does not materially diminish the bleeding.

The steps associated with the freest oozing, namely, the complete separation of the bladder and the division of the sub-ureteric tissues, should be left to as late a stage as possible.

The use of continuous saline infusion during the operation, though

The presence of diseased tubes makes the operation much more difficult on account of the adhesions.

Suppuration or sloughing of the abdominal wound is not uncommon, the infecting organisms being derived from the vagina; extensive sloughing may occur in the deeper planes of the abdominal wound without any appearance of such on the skin, beyond the escape of a small quantity of dark-coloured sero-pus between the superficial stitches.

In all such cases the wound should be completely opened up and treated by frequent application of peroxide of hydrogen.

The best method of preventing infection of the parietal wound is to cover its edges with thin sheet rubber in the manner already described.

RADICAL EXTIRPATION BY THE VAGINAL ROUTE (SCHAUTA'S OPERATION)

The radical vaginal operation consists in a wide extirpation of the uterus and vagina and their adnexa from below.

It has been extensively practised by the originator with good results, but it has the drawback that it is impossible by this means to remove the iliac glands, or even to know that they are affected before the operation is practically concluded.

It is nearly as difficult as the abdominal operation, though the primary mortality is smaller, because the patients suffer less from shock.

In the writer's opinion it is inferior to the abdominal operation, but it is sometimes to be preferred, namely in very obese patients or in those who by reason of age or constitutional weakness may be deemed unfitted to undergo the alternative proceeding.

The steps of the operation are as follows:

Previous preparation. This is similar to that already described on page 152, but inasmuch as the vagina is removed entire and closed, it is less important to effect a thorough cleansing of the growth.

Anæsthetic. Chloroform is preferable in most cases for the reasons given on p. 151.

This operation is far more suitable for spinal anæsthesia than the abdominal procedure.

Position. The lithotomy position.

Closure of the vagina. The vagina and growth having been thoroughly cleaned by the application of some strong antiseptic, the former is packed with gauze. The lower end is then dissected free all round and closed by sutures, the ends of which are left long to act as tractors (Fig. 69).

Separation from the rectum. The posterior vaginal wall is now separated for its whole length from the rectum.

If the patient survives, spontaneous closure of the fistula almost always occurs.

Injury to the great vessels. Small lateral perforations of the external iliac vein can be closed by ligature without harmful results.

An injury necessitating complete occlusion of the vein is very serious. A similar accident to the common iliac vein is a disaster, and the patient is very unlikely to recover.

Ligature of both hypogastric arteries as a preliminary proceeding has already been referred to.

The most serious arterial complication is thrombosis of the external iliac artery. I have seen three such cases. It is probably due to injury of the artery during the removal of the iliac glands conjoined with very feeble heart action, the result of shock.

If the patient survives, more or less extensive gangrene of the leg is almost certain.

A thrombus may spread from a ligatured hypogastric artery into the common iliac artery. This is the drawback to preliminary ligature of the former vessel.

Septic infection of the operation area. More or less extensive infection of the large cavity left under the new peritoneal floor is probably of constant occurrence, and accounts for the fever commonly observed during the second week of convalescence. It is to be minimized by cleansing the growth and vagina as far as is possible before commencing the operation. In most of the advanced cases unfortunately streptococcal infection of the growth and vagina has already occurred, and to sterilize the vaginal mucosa is impossible. The insertion of gauze packing at the termination of the operation, as advised by Wertheim, undoubtedly assists drainage by delaying the closure of the upper end of the vagina.

Very serious suppuration may occur under the new peritoneal floor, which may terminate in death or only be recovered from after a long period of high fever and wasting.

In such cases the upper end of the vagina should be kept open by occasionally passing the finger through it into the sub-peritoneal cavity beyond.

Peritonitis. Peritonitis has been a comparatively rare cause of death in the cases that have come under the author's experience. When it does occur it is secondary to infection of the sub-peritoneal space already mentioned.

In many of the advanced cases salpingitis will be found when the abdomen is opened. This may range from simple thickening and adhesion of the appendages to hydrosalpinx, pyosalpinx, or tubo-ovarian abscess.

Separation of the urethra and bladder. The urethra and bladder are now separated from the anterior vaginal wall.

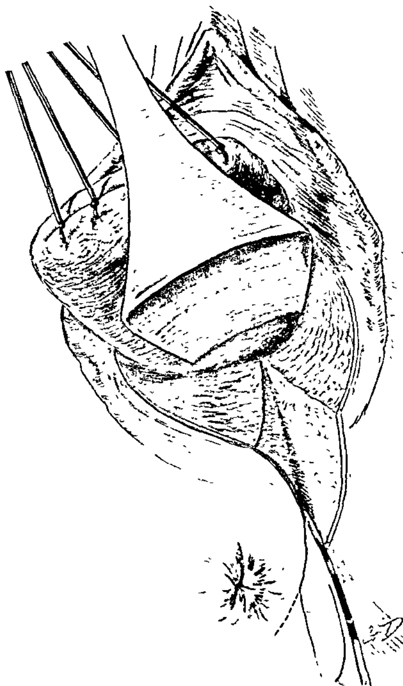


FIG. 70. RADICAL EXTIRPATION BY THE VAGINAL ROUTE. *Making the para-vaginal incision after separation of the vagina from the rectum.*

Lateral separation of the vagina. The lateral walls of the vagina are now separated by division of the para-vaginal tissue as far outwards as possible.

The para-vaginal incision. By means of a scalpel an incision is made starting in the left para-rectal tissue high up, continuing through the

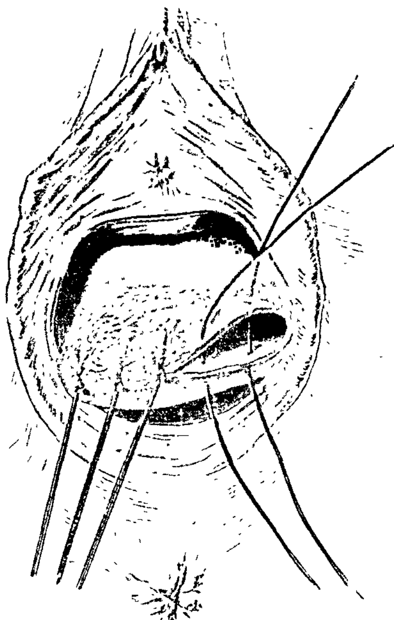


FIG. 69. RADICAL EXTIRPATION BY THE VAGINAL ROUTE. *Separation and closure of the lower end of the vagina.*

left levator ani, and appearing on the skin just to the left of the anus, from whence it is carried backwards in a curve nearly to the coccyx.

This incision enormously increases the room in which the operator has to work.

It produces much hæmorrhage which should immediately be controlled.

The ureters having been seen, are pushed laterally as much as possible by the fingers, and a broad retractor is then inserted to keep both ureters and bladder out of the way.

Opening the peritoneal cavity in front. The peritoneal cavity is now opened by snipping through into the utero-vesical pouch.

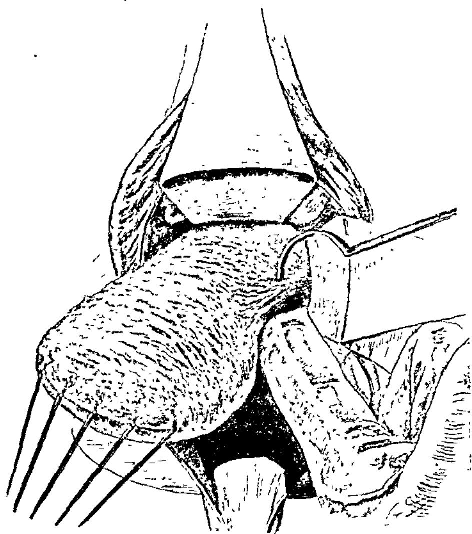


FIG 72 RADICAL EXTIRPATION BY THE VAGINAL ROUTE. *Beginning the ligature of the tissues lateral to the vaginal vault and cervix.*

Opening Douglas's pouch. The detached vagina having been pulled forwards, the peritoneum at the bottom of Douglas's pouch is now divided.

The finger should then be introduced and if the appendages be found adherent they should be separated as far as possible.

Division of the broad ligaments. The division of the broad ligaments is now proceeded with in a manner similar to that of a simple

There is usually free bleeding which must be controlled by forceps.

Exposure of the ureters. The anterior dissection is now continued until the termination of the ureters in the bladder is plainly visible.

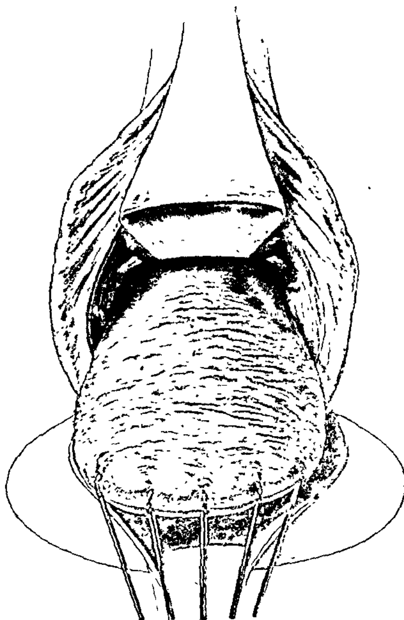


FIG. 71. RADICAL EXTIRPATION BY THE VAGINAL ROUTE. *Separation of the vagina from the bladder and exposure of the ureters.*

This is the most difficult part of the operation (Fig. 71).

A broad expansion of very vascular fibro-cellular tissue runs on either side, backwards and laterally towards the vaginal vault.

These bands require division and bleed freely.

CHAPTER II

OPERATIONS FOR CARCINOMA OF THE BODY OF THE UTERUS

Carcinoma of the body of the uterus is to be treated by removal of the entire uterus, together with the appendages and the upper part of the broad ligaments.

It is not necessary or proper to carry out so radical a procedure as that for carcinoma of the cervix because the lymphatic tracts liable to be permeated in carcinoma of the body are different. They run upwards in the ovario-pelvic folds and communicate with the lumbar and aortic glands.

A sufficient extirpation can therefore be carried out by performing a wide total hysterectomy without subjecting the patients to the risks of a much more severe procedure from which they would gain no commensurate benefit.

The uterus may be removed either from above (abdominal total hysterectomy) or from below (vaginal hysterectomy).

As the technique of these operations is described elsewhere it is unnecessary to repeat it here (see pages 109 and 83).

The abdominal route is the best in all but very stout or very feeble patients. Whichever method is adopted the cervical canal should first be sutured up to prevent the escape of carcinoma cells during the operation.

The ultimate results of the operation. The ultimate results are much better in the case of cervical disease. Probably at least 75% of those recovering from the operation remain free from recurrence, provided, of course, it is not carried out in cases in which the growth has obviously got beyond the confines of the uterus.

vaginal hysterectomy, except that it is possible to apply the ligatures much further outwards (Fig. 72).

The uterine artery should first be secured.

When the lower half of the para-metric tissue has been divided, access to the upper part of the broad ligaments is facilitated by anteflexing the uterus under the bladder.

Termination of the operation. The removal of the uterus being completed, the peritoneum may be closed over the upper end of the wound by catgut sutures, and all oozing points must be ligatured.

The para-vaginal incision should now be closed by sutures as far as is possible.

CAUSES OF DEATH AND COMPLICATIONS OF THE OPERATION

These are similar to those described when dealing with the abdominal operation.

ULTIMATE RESULTS

The results claimed by Schauta in a very large number of cases are nearly as favourable as those claimed by Wertheim, but his operability-rate is considerably lower.

In this country it has been very little practised. In the writer's small experience the results have been good as regards primary mortality, but not so good as the abdominal operation in regard to freedom from recurrence. The period of convalescence is a long one, and the wound may suppurate badly or even slough.

CHAPTER II

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SECTION VII

THE OPERATIONS FOR PROLAPSE OF THE UTERUS

BY

HENRY JELLETT, M.D., F.R.C.P.I.,
Master, Rotunda Hospital, Dublin

CHAPTER I

THE OPERATIONS FOR PROLAPSE OF THE UTERUS

THE operative treatment of prolapse of the uterus, to be successful, must be based on a full knowledge of the conditions actually present and of their causes. Prolapse of the uterus is essentially a complicated condition in which many lesions, some causal and some consequential, are associated. It is not always possible to say which is a causal and which a consequential lesion, but each of them requires treatment.

PRELIMINARY CONSIDERATIONS

The first step in determining the extent of the operative treatment necessary is to ascertain the extent of the prolapse. In order to do this, a preliminary examination of the genital organs is made to ascertain whether there is any visible prolapse of the vagina or of the uterus and any lesion of the vulva or levatores ani. The patient should be told to cough several times during this examination, as a prolapse may then occur owing to the increase in intra-abdominal pressure. Next, the cervix should be caught with an American forceps and drawn down in order to see if it can be drawn outside the vulva, and, if so, how far. As this is done, the patient should again cough, so as to tend to bring the uterus out as far as its ligaments will allow. In many cases the prolapse may be so complete that it is visible without any straining effort or traction; but in others, where the prolapse only occurs when the patient walks about, the uterus may have gone up again into position, and may only descend when some driving or pulling force is applied to it. The next step is to ascertain what part of the prolapse is formed by the uterus, and what part by the vaginal walls. This is readily done by trying to pass the finger into the vagina. If the vagina is completely inverted this will be impossible (Fig. 74); if it is partly inverted, it will be possible to introduce the finger for a short distance, corresponding to the length of the part of the vaginal canal still in its proper position. It is obvious that in all cases of true descent of the uterus as a whole there must be some descent of the upper part of the vagina also, and, where this does not occur, the prolapsed part will be found to consist of an elongated vaginal portion

of the cervix alone. When the vagina prolapses, we must determine what part of it is chiefly involved. In many cases this will be the entire canal; in some, the anterior and posterior walls; and in some, one wall only (Fig. 76). If the anterior wall prolapses, the condition is known as cystocele, and one will probably find that the bladder is carried down beneath the vaginal mucous membrane. Where the posterior wall prolapses, the condition is spoken of as rectocele, but it does not follow

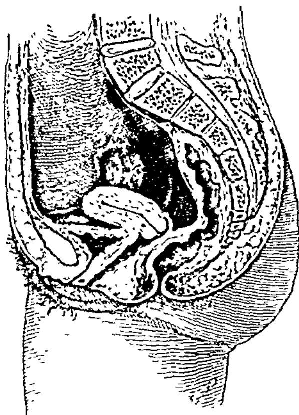


FIG 73. THE NORMAL POSITION OF THE UTERUS IN THE PELVIS WHEN THE BLADDER IS EMPTY.

that in all cases the anterior rectal wall also prolapses. In some cases it does so, but in the majority it is probable that the rectum does not share in the descent. The position of the bladder can be readily ascertained by passing a catheter or sound into it, and the position of the rectum by passing the finger into it. At the same time as the vaginal examination is made, we must ascertain the condition of the levator ani muscle. In all cases of prolapse occurring as a result of injury received during parturition, the levatores ani are torn. In prolapse occurring as a so-called congenital condition, laceration of the levatores ani has not occurred, but still, owing to the continued pressure of the prolapsed

uterus, over-distension and relaxation of these muscles are usually present. The condition of the muscle can be determined by estimating the thickness of the tissue lying between the vaginal mucous membrane and the tuberosities of the ischium. Where no perineal laceration has occurred, the anterior edges of the muscle approach one another in the depth of the perineum, and blend with the superficial perineal muscle, while anterior to the point of blending they form a definite band which



FIG. 74. COMPLETE PROLAPSE OF THE UTERUS WITH INVERSION OF THE BLADDER. There is also some supra-vaginal hypertrophy of the cervix.

can readily be felt from the vagina. If the muscle has been deeply torn this band is missing or lies at a higher level in the vagina than is normal, and the mass of the muscle can be felt between the mucous membrane and the ischial tuberosities, its distance from the central line of the perineum being proportionate to the extent to which it has been torn. If the muscles are atrophied by over-distension, and are absent altogether from the perineal region, owing to excessive tearing, then the surfaces of the ischial tuberosities, as felt from the vagina, are abnormally distinct, and suggest that nothing lies over them except the vaginal mucous membrane.

The examination of the uterus comes next. We have already ascertained whether the cervix prolapses, and, if so, how far, and we must now learn what other changes have occurred, and what is the condition of the utero-sacral ligaments. Descent of the cervix may be caused in one of three ways (Fig. 78). First, the vaginal portion may be hypertrophied and elongated, the supra-vaginal portion and the body remaining normal. As a result, the cervix may protrude through the vulva, although the body of the uterus remains in its normal place. Secondly, the supra-

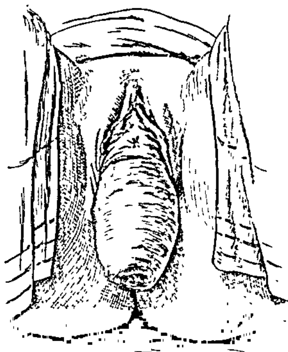


FIG. 75. COMPLETE PROLAPSE OF THE UTERUS WITH INVERSION OF THE VAGINA.

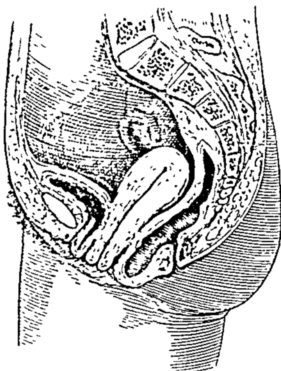


FIG 76. PARTIAL PROLAPSE OF A RETROVERTED UTERUS. There is also considerable supra-vaginal hypertrophy of the cervix, cystocele, and rectocele.

vaginal portion may be hypertrophied and elongated, the body still remaining in its normal position. As a result, the cervix and the upper part of the vagina prolapse, while the body may remain in its proper place. In the third place, the uterus as a whole may descend to a greater or less extent. Accurate diagnosis between these three conditions is essential for correct treatment, and is, as a rule, quite easy. Simple hypertrophy of the vaginal portion is readily recognized by vaginal examination, while a bi-manual examination shows that the body remains at its proper level. The condition of the supra-vaginal portion can be ascertained by noting the distance between the vaginal attachment and the insertions of the utero-sacral ligaments, as, when supra-vaginal

hypertrophy exists, this distance is markedly increased. Elongation of the uterus above the insertion of the utero-sacral ligaments also occurs in some cases. The utero-sacral ligaments can usually be felt from the vagina, and, if present, can always be felt from the rectum. They run an almost vertical course from the second piece of the sacrum downwards to be inserted into the lower part of the body of the uterus, and form the lateral boundaries of the pouch of Douglas. If the finger is placed against them, and at the same time the cervix is drawn down, they will be found

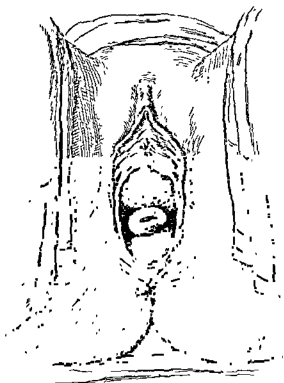


FIG. 77. PARTIAL PROLAPSE OF THE UTERUS, WITH CYSTOCELE AND RECTOCELE.

to tighten and become string-like. Descent of the uterus as a whole is recognized by palpating the body of the uterus, and noting its position relative to the pelvic outlet. In such cases, examination of the utero-sacral ligaments shows that they are elongated, while in supra-vaginal or vaginal hypertrophy of the cervix existing without prolapse of the body of the uterus, these ligaments preserve their normal length.

We must always remember that any of the conditions mentioned above may occur in association with one another. Thus perhaps the commonest state of affairs in a well-marked prolapse is partial or complete inversion of the vagina, partial or complete prolapse of the uterus, considerable supra-vaginal elongation of the cervix, and a varying degree of lengthening of the utero-sacral ligaments.

In addition to determining the length of the cervix, one must also determine whether there is any 'erosion', true ulceration, or laceration

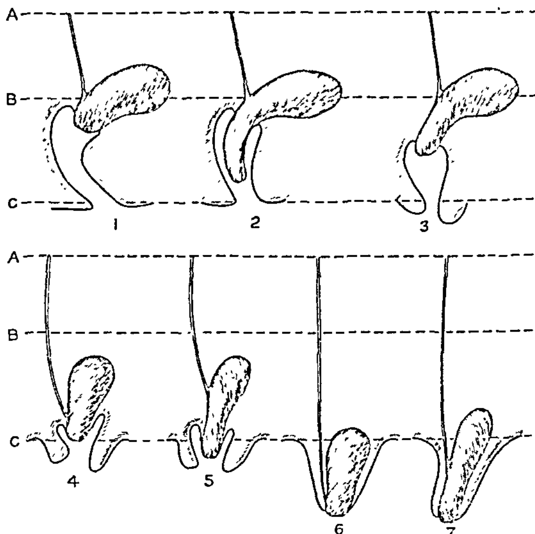


FIG 78. DIAGRAM TO SHOW THE DIFFERENT CONDITIONS UNDER WHICH APPARENT OR ACTUAL PROLAPSE OF THE UTERUS IS SEEN. A. Normal point of origin of the utero-sacral ligaments. B. Normal level at which these ligaments are inserted into the uterus. C Normal level of the perineum. 1. The normal position and condition of the uterus. 2. Hypertrophy of the vaginal portion of the cervix. 3. Supra-vaginal hypertrophy of the cervix. 4. Partial prolapse of the uterus with elongation of the utero-sacral ligaments 5. Partial prolapse of the uterus with supra-vaginal hypertrophy. 6. Complete prolapse of the uterus with inversion of the vagina. 7. Complete prolapse of the uterus and inversion of the vagina, with supra-vaginal hypertrophy of the cervix.

present. This is readily done after the cervix has been drawn down externally.

The last step consists in the examination of the appendages of the uterus and the abdominal contents generally, with the object of

eliminating any cause of increased intra-abdominal pressure such as tumours, ascites, marked and constant intestinal distension, and excessive fat. When this step is complete we are in a position to determine the correct operative treatment.

Operative treatment is always indicated in the case of healthy young and middle-aged women, and also in old women who desire to lead an active life, and whose general health does not contra-indicate operation. The palliative treatment of prolapse by pessaries is always unsatisfactory, and its disadvantages become greater the older the patient becomes, and the longer the pessary is worn. The very cases which are least amenable to operative treatment are also least amenable to pessary treatment, and in many of such cases, although operation may not succeed in producing a permanent cure, still it may, and probably will, place the patient in a position in which more satisfactory relief can be obtained from pessary treatment. In the majority of cases, however, operative treatment renders a pessary unnecessary.

THE OPERATIVE TREATMENT

The operative treatment of prolapse is directed to the removal of the complications and associated lesions already described, so as permanently to prevent the recurrence of the prolapse. In some cases however, owing to the age or state of health of the patient, lengthy operations are impossible, and then the measures adopted may be directed solely to the removal or cure of such conditions as prevent the wearing of a pessary. Thus, if a patient has a large erosion of the cervix causing much leucorrhœa which is intensified by a pessary, amputation of the cervix may enable the latter to be worn satisfactorily. Or, if a deep laceration of the perineum prevents the retention of a pessary or necessitates the wearing of one too large for the vaginal canal, a perineorrhaphy will enable a pessary of suitable size to be worn. Such operations are, however, only palliative, and, wherever possible, a true radical cure, which will prevent the necessity of again wearing a pessary, is preferable.

As has been said, the different lesions which may be associated with prolapse, either as causal factors or as complications, are numerous, and a correct diagnosis of the extent of each and all of them is necessary before one can decide on the most suitable operative treatment. It is the neglect of this somewhat obvious step that has led to the so frequent failure of operative treatment. Thus, ventral fixation has been done with the object of preventing the descent of the fundus, while at the same time the condition of the utero-sacral ligaments has been neglected, with the result that in a short time the prolapse is in a worse condition than

it was before the operation. Vaginal fixation has been done and the condition of the pelvic floor neglected, with a very similar result. Perineorrhaphy has been done, and the condition of the cervix and the position of the uterus neglected, with again a similar result, and so on. Where deficiency of the uterine supports once begins to manifest itself, it quickly brings in its train other lesions, which in turn are capable of aggravating the original one, and even of reproducing the latter, if, after its removal, they are allowed to persist.

If we take, for example, a typical case of complete prolapse associated with the usual complications, and discuss its treatment, it will give, perhaps, the best idea of the operative procedures that are usually necessary (Fig. 74). In such a case the uterus will be enlarged and completely prolapsed outside the vulva, and, if it is pushed back to its normal level, it will fall into a position of retroversion and retroflexion. The entire vagina will be inverted. The bladder will have followed the anterior wall and so will be in great part outside the vulva, and the rectum may similarly have followed the posterior wall. The utero-sacral ligaments will be markedly lengthened, and so will be the round ligaments. The cervix will be hypertrophied supra-vaginally, and the vaginal portion will probably be ulcerated. The levatores ani muscles will be torn, and the vulval orifice considerably enlarged.

For the cure of such a case, it will be necessary, first, to adopt measures that will ultimately effect a reduction in the size of the uterus; secondly, to fix the uterus at its normal level and the fundus in a position of anteversion; thirdly, to remove the hypertrophied cervix; fourthly, to restore the bladder and the rectum to their proper positions, or at any rate to a position in which they cannot again bulge downwards through the vulva; fifthly, to remove superfluous vaginal mucous membrane; and sixthly, to restore the muscles of the pelvic floor. All these will be effected somewhat as follows. Curetting of the uterine mucous membrane will tend to bring about ultimately a healthier state of the uterus, and so a reduction in size if the enlargement is due to a chronic inflammatory process. Where tumours are present, such as small myomata, they must be removed by enucleation or myomectomy. Ovarian tumours, if small, may be removed by the vaginal route, but if large, the abdominal route is preferable Shortening of the utero-sacral ligaments will bring the cervix again to its normal level in the pelvis. Shortening of the round ligaments or ventral suspension will keep the uterus in a position of anteversion. Interposition of the uterus between the bladder and the anterior vaginal wall will support both the vaginal wall itself and the bladder, and, by fixing the uterus in a position of aggravated anteversion, will render any other step to accomplish that end unnecessary. Supra-

vaginal amputation of the cervix will remove the hypertrophied portion. Anterior colporrhaphy, when the interposition operation is not performed, will remove superfluous mucous membrane from the anterior vaginal wall, and at the same time will give some support to the bladder. When the interposition operation is performed, anterior colporrhaphy is unnecessary. Finally, a posterior colpo-perineorrhaphy, associated with suture of the levatores ani muscles, will remove any excess of the mucous

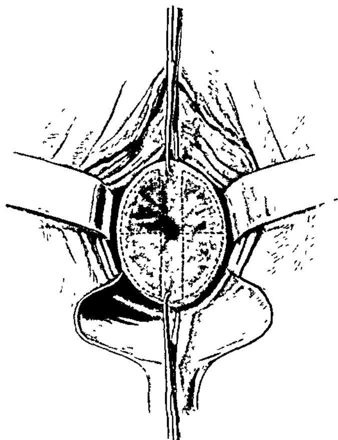


FIG. 79. TRACHELORRHAPHY. *The incisions through the cervical mucous membrane.* These are indicated by the dotted lines.

membrane of the posterior vaginal wall, and will restore the torn muscles and the perineum.

These procedures call for some description, and then we shall see how they may be satisfactorily associated with one another.

Curetting. The removal of the mucous membrane of the uterus is always indicated as a preliminary step, except perhaps when the patient has passed the menopause and there is no leucorrhœa, and when the uterus is atrophic. In the great majority of cases of prolapse the reverse is the case, and the mucous membrane is in a hypertrophic state.

Operation. The operation of curetting has been described on p. 70, and need not again be described here. Care should be taken to remove the entire mucous membrane, and when this has been done it is often well to inject a 50 % solution of formalin into the uterus. This is allowed to act for from five to thirty seconds, and then is washed out with plain water or saline solution, introduced through a Bozemann's catheter.

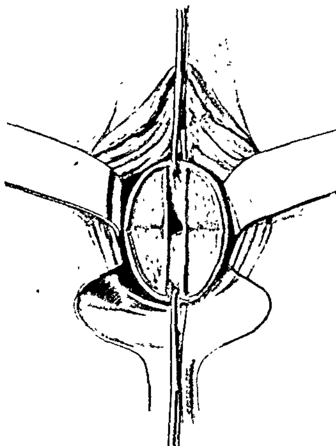


FIG. 80. TRACHELORRHAPHY. *Denudation of the cervix.* A strip of mucous membrane has been left in the centre to form the new cervical canal.

Trachelorrhaphy. This operation has been described on p. 78, but, as it frequently forms an important part of the operative treatment of prolapse of the uterus, it is well to recapitulate it here.

Operation. The anterior lip of the cervix is grasped with a bullet forceps in the middle line, and the posterior lip similarly with another. Two incisions are then made running from front to back. They traverse the exposed surface of the cervix, and include between them a strip of mucous membrane, which will subsequently form the new cervical canal (Fig. 79). Starting with the incision on the patient's

left, a second incision is made round the edge of the old cervical laceration (Fig. 80), and the piece of mucous membrane which is included between the two incisions, and which has grown over the laceration, is dissected up, if possible in one piece, so as to ensure its complete removal. A similar denudation is then carried out at the opposite side. Sutures are next passed as shown in the drawings, with the object of bringing

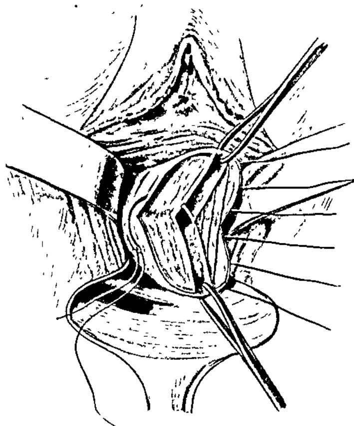


FIG. 81. TRACHELORRHAPHY. *Insertion of the sutures.* On the left the sutures have been inserted. On the right, the first suture is being introduced.

each half of each denudation into contact with its corresponding half. The position of these sutures is seen in Fig. 81, and when they are tied the original shape of the cervix is restored. Each suture is entered through the mucous membrane of the vaginal portion of the cervix, passes below the denuded surface, and emerges just at the edge of the strip of cervical mucous membrane left to form the new cervical canal. It then passes to the opposite edge of cervical mucous membrane under the exposed surface, and out again through the mucous membrane of the vaginal portion.

Vaginal amputation of the cervix. This operation consists in the removal of a part of the vaginal portion of the cervix, so as to get rid of an erosion or true ulceration. Although this operation has been described on p. 76, it will be well here to recapitulate its chief steps, which differ somewhat from those of the usual operation.

Instruments. The instruments required are similar to those used in supra-vaginal amputation (*vide infra*).

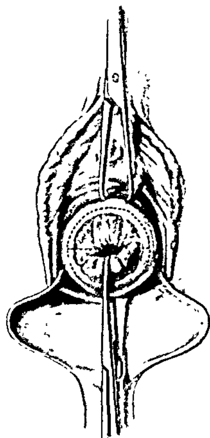


FIG. 82. AN EROSION ON A PROLAPSED CERVIX. The dotted lines show the position of the incisions made when performing vaginal amputation.

Operation. The first step is to catch the anterior lip of the cervix with a bullet forceps, and the posterior lip with another. The anterior forceps should be so applied as to grasp the piece which it is desired to cut out. A bi-lateral incision is then made through the cervix from side to side, extending upwards from half to three-quarters of an inch, and laying open the cervical canal (Fig. 82). A third forceps is applied to the anterior surface of the cervix just above the line of the proposed incision, and the piece grasped or held in the first forceps is cut out of the anterior

lip. This is done by means of two incisions: one starting on the cut face of the anterior portion of the cervix, and the other extending round the cervix externally. These two incisions meet one another in the thickness of the cervix, so including a wedge-shaped piece of tissue. A suture is then passed with a curved needle through the centre of the anterior edge of cut mucous membrane, and then beneath the bed of the excised portion, to emerge through the mucous membrane of the cervical

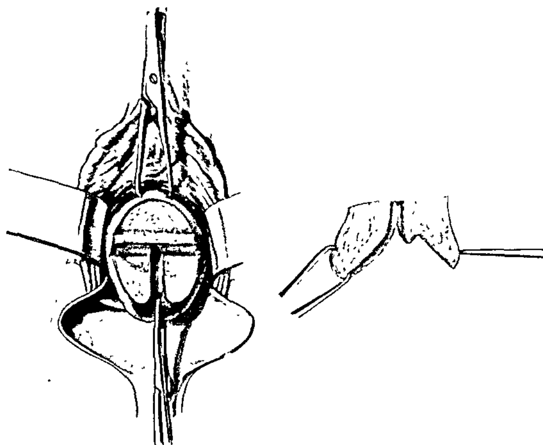


FIG. 83. VAGINAL AMPUTATION OF THE CERVIX. *A wedge-shaped piece has been excised from the anterior lip.* The smaller drawing shows the result in section.

canal. When this is tied it brings the external mucous membrane into contact with that of the cervical canal (Fig. 84). The bullet forceps on the posterior lip is then readjusted so as to grasp the piece it is desired to remove, and this piece is similarly cut out by two incisions, and a suture is introduced, starting from the cervical mucous membrane, then passing beneath the cut edge to emerge through the posterior mucous membrane. When these two sutures are tied there will be left at each side an oval area of raw tissue, the edges of which are brought together by two or three sutures passed from before backwards and traversing the cervical mucous membrane, the cervical muscle, and then

the cervical mucous membrane again (Fig. 85). In this way, all raw surface is covered and the shape of the cervix is restored.

Supra-vaginal amputation of the cervix. This consists in amputating the cervix above the attachment of the vagina, and below the attachment, or through the attachment of the utero-sacral ligaments.

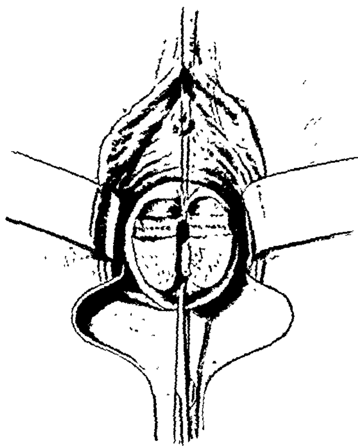


Fig. 84. Vaginal Amputation of the Cervix. *The first suture inserted.*

Instruments. Three American forceps; a scalpel; dissecting forceps with teeth; ten clip forceps; a few whole-curved needles; a needle-holder; silkworm-gut and catgut; and a posterior speculum.

Operation. The first step of the operation consists in ascertaining how far the bladder comes down on the cervix, in order to avoid injuring it. The cervix is then caught with an American forceps and drawn down as far as possible A circular incision is next made round it, where the vaginal mucous membrane passes on to the cervix. This incision cuts through the vaginal mucous membrane, and also through the attachments of Mackenrodt's ligaments. A collar of vaginal mucous membrane

is then pushed up off the cervix, when the bladder and the remaining attachments of the ligaments are exposed. If there is but slight supra-vaginal hypertrophy of the cervix, the attachments of the utero-sacral ligaments will also be exposed at once; but if there is considerable hypertrophy, the attachments of these ligaments will lie somewhat higher, and will not be exposed at first. The point at which it is desired to

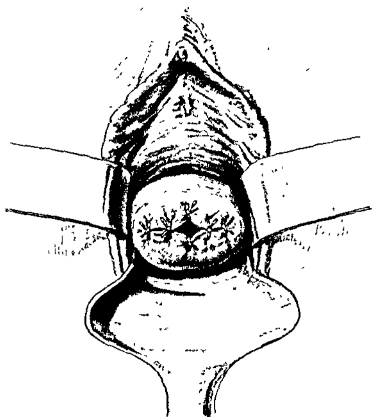


FIG. 85. VAGINAL AMPUTATION OF THE CERVIX. *The appearance of the cervix when the operation is finished.*

amputate the cervix is selected, and the cervix is caught with an American forceps above this point. Amputation is then performed through the selected point, the cervix being simply cut across with a single incision. The vaginal mucous membrane is brought back in such a manner as to cover over the bare cervical stump, and when doing this, care is taken to include in the suture the cut edges of Mackenrodt's ligaments. In replacing the mucous membrane, care must be taken to see that it fits accurately, as there is naturally a tendency for it to become puckered, because its cut edge is greater than the circumference of the cervical canal. Each suture is introduced through the cervical canal,

passing through the wall of the cervix, and then through the collar of vaginal mucous membrane, at a sufficient distance from the cut edge to leave enough mucous membrane to cover over the cut cervix. Catgut may be used for the greater part, but occasional sutures of silkworm-gut are advisable, for fear the catgut may be absorbed too soon. Excess of vaginal mucous membrane can sometimes be got rid of by carrying it round to the front of the cervix, and then suturing it in such a manner as to add to the length of the anterior vaginal wall, at the same time trimming it, so as to prevent irregularities of the surface.

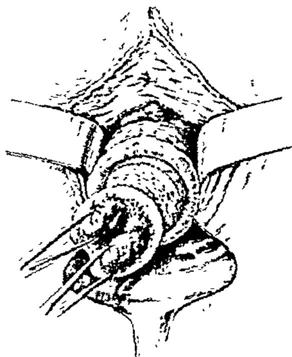


FIG 86. SUPRA-VAGINAL AMPUTATION OF THE CERVIX. The cuff of vaginal mucous membrane has been turned up and the cervix exposed. The dotted line shows the position of the amputating incision.

Anterior colporrhaphy. Anterior colporrhaphy is the term applied to removal of a piece of mucous membrane from the anterior vaginal wall, with the object of narrowing the vagina.

Instruments. The instruments required are similar to those used in supra-vaginal amputation of the cervix

Operation. The first step consists in applying a bullet forceps to the cervix, and drawing it down as far as possible. The mucous membrane of the vagina is then caught in the middle line with a second pair of forceps, applied just below the urethra. By drawing these forceps in opposite directions, the mucous membrane between them can be put on the stretch. An oval piece of mucous membrane is then marked

out by an incision running round it. This piece is almost the length of the distance between the forceps, and its width is governed by the amount of tissue that it is desired to remove. The incision passes completely through the mucous membrane, and then with a little dissection the entire enclosed part can be lifted in one piece. Beneath it the bladder is exposed, and if the latter has become unduly prominent, as is usually the case in a well-marked cystocele, it must be separated from the uterus, and from the vaginal mucous membrane laterally and pushed up. The

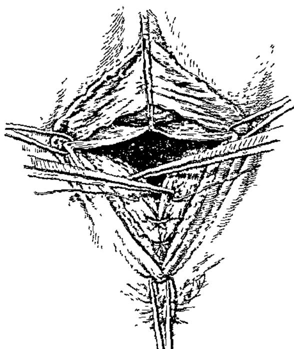


FIG. 87. COLPO-PERINEORRHAPHY. *Suture of the levatores ani muscles.* The vaginal flap has been trimmed.

cut edges of mucous membrane are then brought together by a continuous catgut suture, beginning in the region of the cervix, and continuing upwards towards the urethra. If there is much strain on the tissues, it is well to supplement the catgut by a few stitches of silkworm-gut, which can subsequently be removed.

Colpo-perineorrhaphy. Colpo-perineorrhaphy is the term applied to the suture of a torn perineum, and the removal of any redundant mucous membrane from the posterior vaginal wall. A great number of different operations have been devised from time to time. The following operation is the one which we habitually perform, and have performed for the last six or seven years. It involves careful suture of the torn levatores ani muscles and so is more suitable for use in the case of prolapse than are operations of the type of the Lawson Tait operation.

Instruments. The instruments required are similar to those for supra-vaginal amputation of the cervix, with the addition of a pair of angled perineal scissors.

Operation. The perineum is carefully examined with a view to determining the extent of the original laceration and also the condition

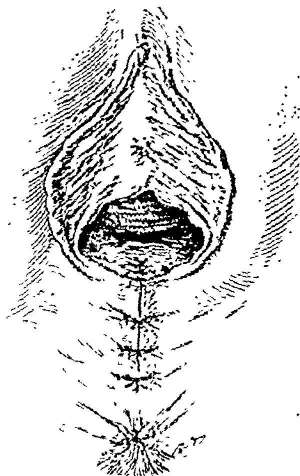


FIG. 88 COLPO-PERINEORRHAPHY. *The skin sutures tied.* The posterior vaginal wall is shown in order to display the line of continuous suture. Actually, however, the wall is quite out of view once the sutures are tied.

of the levatores ani muscles, which will be felt at each side of the tear. Three American forceps are then applied ; one at each side of the anterior end of the laceration, and the third posteriorly in the middle line, slightly in front of the anus. A semicircular incision is then made starting at one of the lateral forceps and extending round the orifice of the vagina to the opposite one This separates perineal skin from vaginal mucous membrane A triangular flap of vaginal mucous membrane is then carefully dissected up. Its apex lies some distance up the posterior vaginal

wall, and its base is the incision just made. The lower part of this flap will be found firmly adherent to the rectum, the result of old cicatricial union, but once this part is passed, the separation of the flap is easy. The levatores ani muscles are found lying at each side of the exposed rectum, and it is well to catch each of them with a clip forceps, and draw it towards the middle line. Three or four catgut sutures are passed through the muscles in such a manner as, when tied, to bring them together in the middle line, but they are not tied at this stage (Fig. 87). The excess of vaginal mucous membrane is removed, usually as a triangular piece, and the cut edges of mucous membrane are brought together from above downwards with a continuous catgut suture. As soon as this is done, the sutures through the levator muscles are tied and the ends cut short. Then a series of three or four silkworm-gut sutures are passed from the skin surface of the perineum from side to side, in such a manner as to include both the perineal skin, and also the muscle lying underneath. When these sutures have been tied (Fig. 88), it is well to put a firm tampon of iodoform gauze in the vagina, in order to keep the vaginal mucous membrane firmly pressed against the upper part of the levator ani and the rectum, and so to avoid any risk of a hæmatoma forming above the muscle.

When prolapse occurs in unmarried women, separation of the levator muscles is often present, in consequence of the stretching to which they have been subjected by the prolapsed uterus. In such cases, although there has been no perineal laceration, it is usually wise to bring the muscles together more tightly in the middle line. This is done in the manner just described.

Shortening of the utero-sacral ligaments. Shortening of the utero-sacral ligaments by the vaginal route can be carried out either by the intra-peritoneal method described by Wertheim, or by the extra-peritoneal method, which we have described ourselves. Perhaps naturally, we prefer the latter method. It consists in exposing the ligaments at their point of insertion into the uterus by means of a circular incision round the cervix at the cervico-vaginal junction, similar to the incision made as a preliminary to vaginal hysterectomy, or to supra-vaginal amputation of the cervix. Each ligament is then caught with a clip forceps and cut off the uterus. It is drawn down and carried round in front of the cervix, where it is secured with sutures (Figs. 89 and 90). At the same time it is shortened to the necessary extent to bring the cervix back to its normal level in the pelvis. It is by no means a difficult procedure, and adds little to the length of the operation.

When it is desired to shorten the utero-sacral ligaments without at

the same time amputating the cervix, a slight modification is necessary. The operation is begun with an ordinary posterior colpotomy incision to expose the ligaments. They are isolated and cut off the uterus as already described. The cervix is then drawn backwards and a short transverse incision is made through the cervico-vaginal junction and if necessary the bladder pushed slightly upwards. Then a clip-forceps is pushed through the fibres of Mackenrodt's ligament at one side of the uterus until it emerges behind, the corresponding utero-sacral ligament

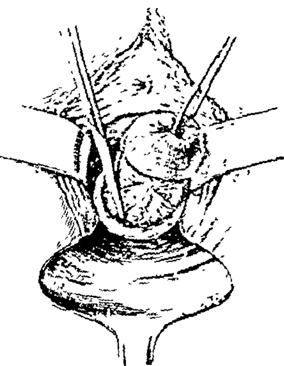


FIG 89 SHORTENING OF THE UTERO-SACRAL LIGAMENTS. *The ligaments exposed and in process of being cut away from the cervix.* It is unnecessary to detach a cuff of mucous membrane right round the cervix as is shown here.

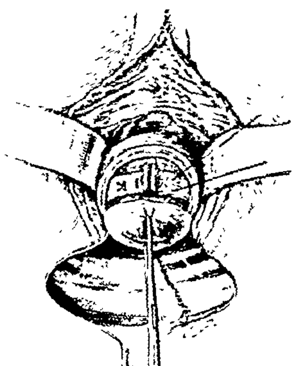


FIG 90. SHORTENING OF THE UTERO-SACRAL LIGAMENTS. *The ends of the shortened ligaments brought round and fastened in front of the cervix.*

is caught and its end is drawn out in front. A similar procedure is carried out on the opposite side. Then the slack of the ligament is pulled out and they are sutured in their new position as before. The incisions are then sutured.

Interposition. Interposition of the uterus between the anterior vaginal wall and the bladder was introduced by Wertheim, and when associated with shortening of the stretched utero-sacral ligaments, is

one of the best methods of maintaining the uterus at its proper level in the pelvis. At the same time it supports the bladder and takes up the excess of vaginal mucous membrane. It thus renders unnecessary any other procedure to keep the uterus in a state of anteversion or any such procedure as anterior colporrhaphy. Essentially, it consists in dissecting up a flap of the anterior vaginal wall, and then opening into the peritoneal

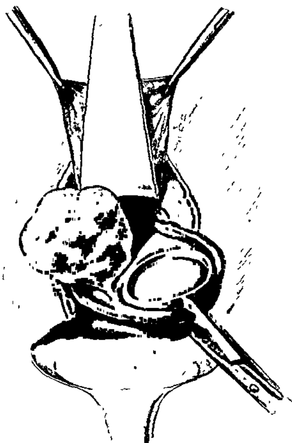


FIG. 91. THE INTERPOSITION OPERATION. *Extroversion of the uterus.* The flap of vaginal mucous membrane lifted off the anterior wall is shown, and the body of the uterus has been drawn down through the colpotomy opening. There is a small ovarian tumour which must be removed.

cavity through the utero-vesical pouch after first pushing the bladder upwards out of the way The body of the uterus is brought out through the opening thus made, and drawn forcibly down (Fig. 91). The peritoneum, forming the anterior edge of the opening in the utero-vesical pouch, is then sutured carefully to the back of the uterus in the region of the insertion of the utero-sacral ligaments, thus making the uterine body extra-peritoneal. The fundus of the uterus is next sutured to the vaginal wall as close as convenient to the urethral orifice, and finally

the same time amputating the cervix, a slight modification is necessary. The operation is begun with an ordinary posterior colpotomy incision to expose the ligaments. They are isolated and cut off the uterus as already described. The cervix is then drawn backwards and a short transverse incision is made through the cervico-vaginal junction and if necessary the bladder pushed slightly upwards. Then a clip-forceps is pushed through the fibres of Mackenrodt's ligament at one side of the uterus until it emerges behind, the corresponding utero-sacral ligament

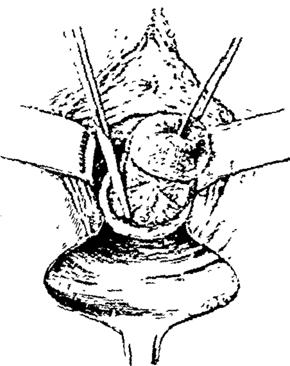


FIG 89 SHORTENING OF THE UTERO-SACRAL LIGAMENTS *The ligaments exposed and in process of being cut away from the cervix.* It is unnecessary to detach a cuff of mucous membrane right round the cervix as is shown here.

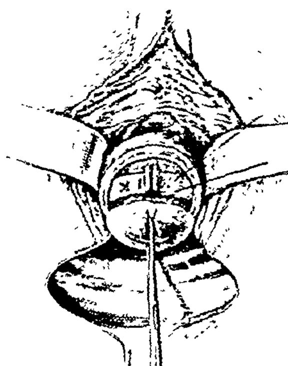


FIG 90. SHORTENING OF THE UTERO-SACRAL LIGAMENTS. *The ends of the shortened ligaments brought round and fastened in front of the cervix.*

is caught and its end is drawn out in front. A similar procedure is carried out on the opposite side. Then the slack of the ligament is pulled out and they are sutured in their new position as before. The incisions are then sutured.

Interposition. Interposition of the uterus between the anterior vaginal wall and the bladder was introduced by Wertheim, and when associated with shortening of the stretched utero-sacral ligaments, is

sequently only permissible in women who are past the child-bearing period.

Instruments. The instruments required are those used in any abdominal operation, such as clamps, retractors; clip, dissecting and American forceps; knife, needles, needle-holder, and suture materials.

Operation. Ventral suspension is a very simple procedure. A catgut suture is introduced through the peritoneum at one side, just above the lower angle of the abdominal incision. It is entered from the inner surface of the peritoneum, about a centimetre from the edge. It passes through peritoneum and sub-peritoneal fat, and again emerges through the peritoneum to appear on the inner surface. It is then passed through the posterior surface of the uterus in the middle line half an inch or so below the fundus, and it includes a piece of uterine tissue about half an inch in width, and a quarter of an inch or so in depth. It then traverses the peritoneum at the opposite side of the incision in a similar manner to that in which it was entered. When the suture is tied, it brings peritoneum alone into contact with the fundus of the uterus, and so ensures an elastic union. Two or three such sutures may be passed, one above the other.

Ventral fixation is not an operation which one often performs, because if it is permissible, interposition of the uterus is also permissible, and is, in our opinion, preferable. The operation consists in suturing the peritoneal edge of the abdominal incision round the fundus of the uterus, in such a manner as to leave the fundus exposed. Sutures are then passed through the fascia and rectus muscle of the one side, then through the fundus of the uterus, and then outward through the muscle and fascia of the opposite side, in such a manner that, when tied, the recti muscles are brought into direct contact with the fundus of the uterus without the intervention of peritoneum. The abdominal incision is then closed in the usual manner.

Operations on the round ligament. There are two main classes of operations on the round ligament, with the object of bringing the uterus into a position of anteversion. The first class includes operations for shortening the round ligaments, either extra-peritoneally at the external abdominal ring—Alexander's operation—or intra-peritoneally, as they pass across the face of the broad ligaments. The second class includes operations for suspending the uterus by means of the round ligaments, as in Gilliam's operation, in which the round ligament is brought out through an opening in the peritoneum, and sutured to the rectus muscle or the rectal fascia; and Webster's operation, where the round ligament is brought behind the uterus and used as a sling to draw it forward.

the vaginal flap is brought back into place so as to cover over the uterine body. As a result, the uterus lies below the bladder, for which and for the anterior vaginal wall it forms a firm support (Fig. 92). It is, in fact, a living pessary which acts in a manner very similar to the old spherical pessary formerly used in such cases. The only objection to this operation is that it cannot safely be followed by pregnancy, and that therefore it may only be performed after the child-bearing period is passed, unless it is accompanied by division of the tubes so as to prevent the passage of an ovum into the uterus If the uterus is too large to lie comfortably

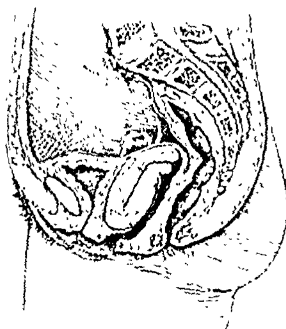


FIG 92 THE INTERPOSITION OPERATION. *Final stage.* The uterus in its new position at the end of the operation.

below the bladder, a wedge-shaped piece may be cut out of it, so reducing it to a proper size: the cut edges are brought carefully together with interrupted catgut sutures

Ventral suspension and fixation. Ventral suspension is the term applied to suture of the fundus of the uterus to the peritoneum of the anterior abdominal wall in the middle line, in such a manner as to keep the fundus in front, while at the same time allowing perfect mobility if pregnancy should occur. Ventral fixation, on the other hand, is the term applied to the fixation of the fundus to the anterior abdominal wall in so firm a manner that a permanent and unyielding bond of union is the result. The latter operation is con-

sequently only permissible in women who are past the child-bearing period.

Instruments. The instruments required are those used in any abdominal operation, such as clamps, retractors; clip, dissecting and American forceps; knife, needles, needle-holder, and suture materials.

Operation. Ventral suspension is a very simple procedure. A catgut suture is introduced through the peritoneum at one side, just above the lower angle of the abdominal incision. It is entered from the inner surface of the peritoneum, about a centimetre from the edge. It passes through peritoneum and sub-peritoneal fat, and again emerges through the peritoneum to appear on the inner surface. It is then passed through the posterior surface of the uterus in the middle line half an inch or so below the fundus, and it includes a piece of uterine tissue about half an inch in width, and a quarter of an inch or so in depth. It then traverses the peritoneum at the opposite side of the incision in a similar manner to that in which it was entered. When the suture is tied, it brings peritoneum alone into contact with the fundus of the uterus, and so ensures an elastic union. Two or three such sutures may be passed, one above the other.

Ventral fixation is not an operation which one often performs, because if it is permissible, interposition of the uterus is also permissible, and is, in our opinion, preferable. The operation consists in suturing the peritoneal edge of the abdominal incision round the fundus of the uterus, in such a manner as to leave the fundus exposed. Sutures are then passed through the fascia and rectus muscle of the one side, then through the fundus of the uterus, and then outward through the muscle and fascia of the opposite side, in such a manner that, when tied, the recti muscles are brought into direct contact with the fundus of the uterus without the intervention of peritoneum. The abdominal incision is then closed in the usual manner.

Operations on the round ligament. There are two main classes of operations on the round ligament, with the object of bringing the uterus into a position of anteversion. The first class includes operations for shortening the round ligaments, either extra-peritoneally at the external abdominal ring—Alexander's operation—or intra-peritoneally, as they pass across the face of the broad ligaments. The second class includes operations for suspending the uterus by means of the round ligaments, as in Gilliam's operation, in which the round ligament is brought out through an opening in the peritoneum, and sutured to the rectus muscle or the rectal fascia; and Webster's operation, where the round ligament is brought behind the uterus and used as a sling to draw it forward.

Shortening of the round ligament. Shortening of the round ligament may be carried out extra-peritoneally, at the external abdominal ring, or intra-peritoneally. The latter operation is not a sound one, inasmuch as it leaves the weaker part of the ligament still supporting the uterus, and cuts out the stronger portion. Extra-peritoneal shortening, on the other hand (Alexander's operation), cuts out the weaker portion of the ligament, and leaves only the strong inner portion. It is an excellent means of curing backward displacements of the uterus that are uncomplicated, and that consequently do not call for an intra-peritoneal operation.

Instruments. The instruments required are similar to those for ventral suspension.

Operation. The first step of Alexander's operation is to place the uterus in a normal position, so as to avoid having to pull it into place by traction on the ligaments. An incision is then made parallel to Poupart's ligament, just over the inguinal canal. Its length depends on the amount of superficial fat, and must be sufficient to expose the external abdominal ring clearly. The pad of fat, in which are buried the fibres of the ligament, lying in the external abdominal ring is caught with a clip forceps, and drawn upwards and inwards. The ligament is thus pulled down, and usually can be seen. It is caught with a clip forceps, which should not include in its grasp anything but ligament, and drawn gently downward, as far as can be done without undue strain. It is then caught a little further with another forceps, and drawn down, and so on. If there are any peritoneal or fibrous bands running into it, these must be divided with a sharp knife, and the ligament brought out quite clear of them As the upper part of the ligament comes down it will bring a prolongation of peritoneum with it, and this should be detached from the ligament and pushed upward. Traction on the ligament is continued in this manner until the part of it lying near the fundus is brought out. This is recognized at once by an increase in the thickness of the ligament. Then either a mattress or a continuous suture is passed, in such a manner as to bring the pillars of the abdominal ring together, each stitch including the ligament. If there is any difficulty in finding the ligament at the ring in the first instance, it is advisable to open the inguinal canal, when, as a rule, the ligament can be clearly seen at once. If the ligament breaks, or if for any reason it cannot be found, the internal oblique muscle is pushed upwards and inwards, the peritoneum is exposed and incised, and then with the patient in Trendelenburg's position, the broad ligament can be seen, the round ligament picked up as it crosses the latter and drawn out into the canal. The ligament on the opposite side is found in a similar manner, pulled out and sutured in place

Suspension of the uterus by the round ligament. Two operations of this kind are described; in the first—Gilliam's operation—a portion of the ligament is pulled out through an opening in the peritoneum and the rectus muscle, and is sutured to the rectus fascia at each side of the abdominal incision; in the second—Webster's operation—a loop of the ligament is pulled backwards through an opening in the broad ligament, made in the clear space beneath the ovarian ligament, and the two loops are sutured together behind the fundus of the uterus. There is the same objection to the latter operation as there is to intra-peritoneal shortening, namely, that it leaves the weaker portion of the ligament still supporting the uterus. Gilliam's operation, on the other hand, cuts out the weaker portion and suspends the uterus by the stronger, as does also Alexander's operation.

Instruments. The instruments are similar to those required for ventral suspension.

The modified Gilliam's operation. After the peritoneal cavity has been opened by the vertical median incision and the uterus exposed, a clip forceps is pushed through the rectus muscle near the lower angle of the abdominal wound, and then through the peritoneum. The round ligament of the corresponding side is caught as it crosses the face of the broad ligament, as close as possible to the uterus, provided that there is sufficient ligament left to come evenly up into place without undue tension. The loop of ligament which is drawn up is then fastened by a suture passing through the rectus fascia and through the loop, and then out through the fascia again. In a similar manner a forceps is passed through the rectus muscle on the opposite side, and the other ligament drawn up and fixed in place. If there is much strain on the ligaments, the loops may be brought out through a small opening in the rectus fascia immediately over the point at which they are brought out through the muscle. Then, after suturing the fascia, the loops may be sutured to one another outside the fascia. The abdominal incision is closed in the usual manner, or perhaps it may be considered well also to do an ordinary ventral suspension.

The original Gilliam's operation necessitates the stripping back of the subcutaneous fat off the fascia of the external oblique muscle, so as to enable the ligaments to be brought out through openings in the fascia external to the recti muscles. The operation described above is simpler and equally efficacious.

Webster's operation. This operation, in which the round ligaments are brought behind the uterus and used as a sling to keep it forward, is carried out as follows: A clip forceps is passed through the broad ligament from behind forwards, just beneath the ovarian

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When the flap is lifted it remains attached in the region of the urethra. This step may be associated with the first step, or may be left until this stage, as is found most convenient.

The bladder is thus exposed, and is pushed upwards off the uterus until the peritoneal reflection is reached. Care must be taken to push up also the lateral portions of the bladder. The peritoneum of the utero-vesical pouch is then opened by a transverse incision.

As soon as this has been done, the utero-sacral ligaments are drawn tightly out through the opening remaining in front of the cervix, which is now pushed up to its normal level in the vagina. Each ligament is then sutured in turn to the anterior surface of the cervix in such a manner as to keep the cervix at the level to which it has been pushed, or they may be sutured to one another below the cervix. Any excess of ligament is removed. The uterine body is next brought out into the vagina through the opening in the peritoneum, in such a manner as to expose the entire posterior uterine wall, and the edge of the vesical peritoneum, forming the anterior margin of the opening in the utero-vesical pouch, is sutured to this wall in the region of the internal os, thus mooring the bladder above the uterus. The fundus of the uterus is then in turn moored to the vaginal mucous membrane as near the urethral orifice as possible, and, lastly, the flap of vaginal mucous membrane is brought back again into place in such a manner as to cover over the uterine body. If the uterine body is large, the entire flap will be required to cover it, and if it is small, any excess of flap may be cut away.

As a result of the fixation of the cervix by the shortening of the utero-sacral ligaments, and of the interposition of the body of the uterus between the bladder and the anterior vaginal wall, it is almost impossible for prolapse of either the uterus or the vagina again to occur. The last step of the operation is the performance of colpo-perineorrhaphy in the manner described on p. 193.

[NOTE. Figs. 79–85 and 91 are reproduced by permission of Messrs. J. & A. Churchill from the forthcoming edition of the author's *Short Practice of Gynæcology*.]

ligament, taking care to pass through a portion of the broad ligament that is devoid of vessels. A loop of round ligament is then caught and drawn backwards through the opening. The ligament at the opposite side is treated in a similar manner, and then the two loops are sutured together behind the uterus.

The complete prolapse operation. The association of the different steps of the complete prolapse operation is a matter which calls for careful consideration, as on it depends greatly the length of the operation and its ultimate success. After the usual dilatation of the cervix and curetting, the first step consists in dividing the vaginal mucous membrane round the cervix, as if for a vaginal hysterectomy. The mucous membrane is then pushed upwards all round, so as to expose the entire length of the cervix. If the cervix is now drawn forcibly forwards, the insertion of the utero-sacral ligaments can be easily seen.

The second step consists in catching each ligament separately with an artery forceps quite close to the uterus, and then in dividing the ligament with scissors between the forceps and the uterus. It is unnecessary to open the peritoneum to do this, but, if one has any doubt as to whether one has actually caught the ligament, it is perhaps better to open into Douglas's pouch. A finger passed into the pouch can then easily palpate the ligaments, and if at the same time one pulls the forceps gently downwards, it is easy to tell by the transmission of the pull to the finger in Douglas's pouch whether the forceps has caught the ligament or not. Each ligament is then drawn gently downwards, freed from its attachment to the peritoneum, so as to allow it to be pulled down still farther and the end of each secured by catching it with a clip forceps.

The third step consists in the amputation of the hypertrophied cervix at the level which seems best. The vaginal cuff is then brought back into position over the stump posteriorly and laterally, leaving the anterior portion still unfastened and taking care that the ends of the utero-sacral ligaments are drawn forwards so as to project through the anterior opening.

The fourth step consists in defining and raising a flap of the mucous membrane of the anterior vaginal wall, and during it the cervix is drawn strongly down, so as to expose and make taut the anterior vaginal wall. The flap is defined by making two vertical incisions through the mucous membrane, starting a little above the level of the urethral orifice, and running to meet the circular incision round the cervix. These incisions lie one at each side of the middle line, and enclose between them a flap 1 inch or 1⅛ inches wide, according to the size of the vaginal wall.

SECTION VIII

OPERATIONS FOR DISEASES OF THE OVARY

BY

SIR JOHN BLAND-SUTTON, F.R.C.S. (Eng.)

Surgeon to the Middlesex Hospital

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CHAPTER I

OVARIOTOMY

Ovariotomy signifies the removal through an abdominal incision of cystic and solid tumours of the ovary, and parovarian cysts.

The history of this operation is of great interest to surgeons because it was the forerunner, so to speak, of all abdominal gynæcological operations; they followed as a natural consequence on the establishment of ovariotomy, and operations on the abdominal viscera generally are to be regarded as an extension of pelvic surgery.

It is usual to state that ovariotomy was first performed by Ephraim McDowell, of Kentucky, 1809: this is of historical interest only, for it had no effect whatever in drawing attention to the feasibility of removing ovarian cysts: it was in fact a still-born operation. The pioneers of this operation were undoubtedly Baker Brown and Spencer Wells in London, Thomas Keith in Edinburgh, and Clay in Manchester. These surgeons brought the operation out of a 'slough of despond' and placed it on firm ground. Spencer Wells and Keith were fortunate later in their work in receiving guidance from Lord Lister's discovery of antisepsis: this, combined with the introduction of the short ligature, firmly established the operation.

The improvement in securing the pedicle has played an important part in the development of ovariotomy. McDowell tied the pedicle, but left the ligature hanging out of the wound. Doran, who has written an excellent review of this matter, ascribes the intraperitoneal method of dealing with the pedicle to the systematic advocacy of Tyler Smith. The method has been followed by brilliant results.

Baker Brown used to sear the pedicle with a cautery, and this method was adopted with great success by Thomas Keith. The method of ligature is so simple and safe that the cautery for this purpose has been long abandoned.

The operation. The preliminary preparation of the patient is described on p. 3. The following instruments are sufficient for the performance of ovariotomy, oophorectomy, and hysterectomy: a scalpel, 12 hæmostatic forceps, 2 dissecting forceps, 2 pairs of scissors with blunt ends, 2 fenestrated forceps, a volsella, 6 curved and 2 straight needles, and silk thread (Nos. 2, 4, and 6) wound on glass or metal spools. A Sims'

speculum and a glass catheter are often useful. The Trendelenburg position is not necessary for the removal of large ovarian tumours, but it is of great advantage in removing small cysts, especially when they adhere to the floor of the pelvis. In cases where the abdomen contains free fluid, ascitic or due to the bursting of a cyst, or pus, it is a wise precaution to conduct the early stages of the operation with the patient in the horizontal position, otherwise the tilting will cause the fluid to gravitate towards the diaphragm. As soon as the fluid has been removed the pelvis may be raised if it be likely to facilitate the operation.

In the early days of ovariotomy it was the custom to tap the cyst, or in the case of multilocular tumours, to force the hand into the mass and break down the septa of contiguous loculi and allow the viscid material to escape. These devices were recommended because it was regarded as a measure of safety to extract the cyst through a small abdominal incision. Occasionally it is possible to withdraw the wall of a large single-chambered parovarian cyst, after tapping, through an incision 7 cm. in length. When the tumour is multilocular, or malignant, or full of grease or pus, it is difficult and extremely dangerous to tap it, as the material may infect the peritoneum either with septic matter or with malignant particles, and end disastrously.

For many years I have abandoned the use of clumsy trocars of all kinds and remove the tumour entire, although it may require an incision from the xiphoid cartilage to the pubes. These large incisions heal quickly, and are not more prone to hernia than the short incisions. This is the only way of ensuring the safety of the peritoneum from being contaminated by the harmful, and often malignant, contents of the cysts. In dealing with burst cysts a free incision enables the surgeon thoroughly and gently to clean the peritoneal cavity.

Access to the pelvis by the abdominal route is usually obtained by an incision in the linea alba between the umbilicus and pubic symphysis. This is known as the median sub-umbilical incision. When the tumour is very large the incision may be extended upwards above the umbilicus, even to the xiphoid cartilage. The disadvantage of an abdominal incision is the liability of the scar to yield and lead to a ventral hernia, a sequel not completely obviated by any known complex method of suture.

Some surgeons advocate an incision a little to one side of the median line, through the fibres of the rectus muscle. This should be condemned because the terminal portions of the nerves supplying the muscle are divided and this leads to its atrophy, and, in itself, is a predisposing cause of an intractable form of hernia.

With the hope of obviating post-operative hernia a transverse incision has been devised. It is made about 6 cm. above the symphysis and

involves the skin, subcutaneous tissue, and the anterior sheath of both recti. The attachment of the sheath to the linea alba is divided with scissors, and the abdomen is then opened by a median incision. The chief advantage claimed for this incision is the avoidance of post-operative hernia. There may be a sentimental advantage in the fact that when the wound is healed the scar left by the operation is concealed by the pubic hair.

In dealing with very large cysts a median incision is invariably employed. Occasionally, difficulty will be encountered on reaching the peritoneum, for, if the cyst has been infected, the peritoneum and cyst-wall may be firmly adherent and even inseparable. In these circumstances it is a wise plan to extend the incision upwards and enter the abdominal cavity well above the tumour. It is also worth while to bear in mind that when the tumour adheres to the abdominal wall it is extremely probable that a coil of intestine may be adherent also. When a tumour is impacted in the pelvis it may push the bladder upward into the abdomen; in such an event this viscus runs great risk of being opened by the surgeon when making the incision. When there is doubt concerning the position of the bladder, an assistant should introduce a sound into it through the urethra.

In a typical case, when the peritoneum is opened the surgeon at once recognizes the bluish-grey glistening surface of the ovarian cyst, and gently sweeps his hand over it in order to ascertain its relations and to learn whether the cyst-wall be free from adhesions. It is of the utmost importance to be satisfied as to the nature of the tumour, especially when the operator follows the unsatisfactory practice of tapping, for if he plunge a trocar into a uterine tumour, or into a pregnant uterus, he will involve himself in anxious difficulty. Decomposing fluid, tenacious mucus, or blood-stained fluid may obscure the parts, and should be sponged away; they indicate a ruptured cyst, a malignant tumour, or a twisted pedicle. Much free blood may be due to the bursting, or abortion, of a gravid tube. When the surgeon has satisfied himself that the cyst or tumour is free to be removed he lifts it out of the abdominal cavity, and if in this process the wall be so thin that it is likely to burst, or actually leaks, the weak spot may be freely incised with a knife over a convenient receptacle.

Adhesions. Although the surgeon may have had reasons to suspect the presence of adhesions, frequently he finds none, and on other occasions when he leasts expects them there are many. The most frequent adhesions are omental, and fortunately they are the least important: they should be detached and tied with thin silk. Adherent epiploic appendages require the same treatment. Intestinal adhesions require care and

patience. When the intestines are adherent by strands and bands, these may be cautiously snipped with scissors; when the adhesions are sessile and soft the gut may be gently detached by means of a moist dab; but if very firm it may be necessary to dissect off a piece of cyst wall and leave it on the gut. The vermiform process requires especial care, for it may be mistaken for an adhesion and divided. When intestines are accidentally opened in the course of an ovariotomy they require the most careful attention. Wounds in the colon may be safely sutured. Holes in adherent small intestine may sometimes be sutured, but if the gut has been extensively involved it may be necessary, and often judicious, to resect a few centimetres and join the cut ends by a circular enterorrhaphy.

Adhesions to the parietal peritoneum are as a rule easily detached with the finger. The most serious adhesions are those which occur in the depths of the pelvis, involving the uterus, bladder, or rectum, and the separation of these may entail such accidents as wounds opening the rectum or bladder, and injury to the ureters and iliac vein. The treatment of such accidents will be considered later.

The pedicle. When the tumour is withdrawn from the belly the pedicle is easily recognized: the uterine tube serves as an excellent guide to it. The pedicle consists of the uterine tube and adjacent parts of the mesometrium containing the ovarian artery, ovarian plexus of veins, lymph vessels, nerves, and the ovarian ligament. When the constituents of the pedicle are unobscured by adhesions, the round ligament of the uterus is easily seen and need not be included in the ligature.

In transfixing the pedicle the aim should be to pierce the mesometrium at a spot where there are no large veins, and tie the structures in two bundles, so that the medial contains the uterine tube, a fold of the mesometrium, and occasionally the round ligament of the uterus; whilst the lateral consists of the ovarian ligament, veins, the ovarian artery, and a larger fold of peritoneum than the inner half.

Pedicles differ greatly; they may be long and thin, or short and broad. Long thin pedicles are easily managed. The assistant gently supports the tumour, whilst the operator spreads the tissues with his thumb and forefinger, and transfixes them with the pedicle needle armed with a long piece of silk doubled on itself. The loop of silk is seized on the opposite side and the needle withdrawn. During the transfixion care must be taken not to prick the bowel with the needle. The loop of silk is cut so that two pieces of silk thread lie in the pedicle. The proper ends of the thread are now secured, and each is firmly tied in a reef-knot; for greater security the whole pedicle may be encircled by an independent ligature, taking care that it embraces the pedicle below the point of

transfixion. (I use No. 4 plaited silk for transfixing the pedicle, and a piece of No. 6 silk for surrounding it.)

After the operator has gained some experience in this simple mode of tying the pedicle, he may, if he thinks it desirable, practise other methods.

After securely applying the ligature the tumour is removed by snipping through the tissues on the distal side of the ligature with scissors. Care must be taken not to cut too near the silk, or the stump will slip through the ligature; on the other hand, too much tissue should not be left. The stump is examined to see that the vessels in it are secure and allowed to retreat into the abdomen. Should it begin to bleed it must be caught with forceps, drawn up, re-transfixed, and tied below the original ligature.

Occasionally a pedicle will be so broad that it is unsafe to trust to this simple form of ligature. Broad pedicles will require three or more ligatures. When several ligatures are required it is important to remember that the ovarian artery lies in the lateral fold of the pedicle and the uterine artery at the medial end, and it is often possible to secure these vessels separately with a thin piece of silk. The pedicle can then be secured with a series of interlocking ligatures. This method is known as the 'mass-ligature'. Many surgeons are dissatisfied with it, and secure the pedicle in the following manner :—

The tumour is raised in order to make the pedicle taut ; the peritoneum covering it is incised in order to expose its vessels ; these are caught with forceps and the tumour detached. The vessels are tied separately with silk or catgut. The cut edges of the peritoneum are then sewn over the stump. This method diminishes the risk of hæmorrhage from slipping of a ligature.

When an ovarian tumour has undergone axial rotation and has tightly twisted its pedicle, the ligature should be applied to the torsioned area ; a single ligature is then sufficient.

It is impossible to frame absolute rules for ligaturing the pedicle. In this, as in all departments of surgery, common-sense must be exercised, and at the present day, when ovariotomy is practised so widely, *no one* would think of performing this operation without assisting at one, or watching its actual performance by an experienced surgeon.

Having satisfied himself that the pedicle is secure, the surgeon examines the opposite ovary, and if obviously diseased it should be removed. Any blood or fluid in the recesses of the pelvis is sponged up. Whilst employed in this way the surgeon gives instructions to have the dabs and instruments counted. When the operator limits the number of dabs to six he can easily have them displayed before him.

It is the custom with most surgeons before suturing the wound to make a careful survey of the abdominal organs. This systematic examination leads to the discovery of many accidental complications of ovarian cysts; some are curious only, but others are of importance in the future conduct of the case.

Suture of the Abdominal Incision. The following method gives very satisfactory results:—

The peritoneum, sheath of the rectus and the edge of the rectus abdominis, skin, and fascia are carefully approximated by interrupted sutures of silk (size No. 4), sterilized by being boiled for an hour and inserted with the hands covered with sterilized rubber gloves. This is known as the through-and-through method of suture; the distance between each suture is rather less than two centimetres. Before the silks are tied, interrupted sutures of silk (No. 2) are used to bring the fascia together; these are introduced at intervals of three centimetres, or less when the abdominal walls are very thin. Before introducing these sutures the surgeon washes his gloved hands in a solution of perchloride of mercury (1 in 5,000). When the main sutures are tied the skin edges are carefully approximated by a continuous suture of thin silk. A wound sutured in this way heals quickly and soundly. Some of the sutures are removed on the eighth and the remainder on the tenth day. The excessive use of buried sutures in the abdominal wall is a cause of post-operative thrombophlebitis and pulmonary embolism (see p. 19).

In the mere description of ovariotomy little attention is given to the complications of the operation arising from variations in the character of the cysts; these influence the procedure in many important particulars. Some tumours of the ovary are as solid as uterine fibroids, others are merely thin sacs filled with fluid of nearly the same specific gravity as water. Many contain a material of the consistence and colour of jelly, a few are filled with blood; some are crammed full of soft dendritic warts; dermoids are stuffed with sebaceous matter, or filled with oil; occasionally a cyst contains pus. As the results of ovariotomy depend in some measure on the nature of the cysts or tumours, it will be useful to offer some remarks on the chief varieties

Suppurating Ovarian Cysts. Suppuration of an ovarian cyst is a recognized, though rare, complication of this disease; it seems somewhat difficult to understand how ovarian cysts become infected, enclosed as they are in air-tight cavities and having no communication with other organs. Many years ago I satisfied myself that the principal sources of infection are the uterine tube, the intestine, the vermiform process, tapping and puncture by foreign bodies. To these we must add infection by the blood-stream in systemic diseases of infective origin, such as typhoid fever.

Typhoid infection of an Ovarian Cyst. It has been known for many years that ovarian cysts may be infected with the *Bacillus typhosus.*

In 1907, I removed a large plum-coloured ovarian cyst from a woman who had been treated for typhoid in India a year previously. I suspected that the cyst contained pus and removed it with great care. Mr. Frank E. Taylor obtained from the pus in this cyst a bacillus in pure culture which in its morphological, tinctorial, cultural, and serum-agglutinating properties was definitely proved to be *B. typhosus.* The patient's serum gave the agglutination test with typhoid bacilli.

In a more remarkable case, I removed a suppurating and leaking ovarian dermoid in which the *B. typhosus* had probably existed in the cyst sixteen years.

It is worth mention that among the ovarian tumours infected by the *B. typhosus* many of them were dermoids. Coe, in reporting an example, suggests that the sebaceous material forms a favourable medium for the development of this bacillus

The presence of the typhoid bacillus as a saprophyte in a suppurating ovarian cyst, many years after a woman had passed through an attack of typhoid fever, ceases to astonish us now we know that it can live in the gall-bladder many years. In the remarkable case described by Dean it was demonstrated in the gall-bladder twenty-nine years after an attack of typhoid fever. There is one gratifying aspect in the surgical treatment of ovarian cysts infected with the typhoid bacillus—the majority of the patients survived ovariotomy and remained in good health.

The most remarkable example of suppurating ovarian cyst which has come under my notice occurred in a woman who had an ovarian cyst, as big as a Jaffa orange, incarcerated in the pelvis by a uterus which contained several fibroids The cyst burst during removal, and, in the course of detaching it from the rectum to which it adhered, I found a fish-bone projecting from the rectum into the cavity of the ovarian cyst. The uterus was removed with the ovarian cyst. The pelvis was drained by means of a tube in the vagina. The patient recovered.

Paterson operated on a girl aged ten years expecting to find an appendix abscess, but found a suppurating ovarian cyst, a rare condition in girls, but in this instance it was probably caused by hairpins which were found impacted in the vagina.

Axial Rotation of Ovarian Cysts. This is a matter of extreme interest to the surgeon, for when an ovarian tumour of moderate size rotates and twists its pedicle, in the form known as acute axial rotation, it gives rise to the severe symptoms common to a strangulated

hernia, minus stercoraceous vomiting. Even fæcal vomiting does not always negative the existence of acute axial rotation of an ovarian tumour, for a loop of bowel is sometimes involved in the twist.

It is a matter which surprises the surgeon when he opens the abdomen expecting an acutely inflamed, or a perforated vermiform process, or an obstructed intestine, but finds a black mass which he gradually recognizes as an ovarian cyst which has twisted its pedicle.

A rarer complication is an ovarian cyst which has suddenly increased in bulk, and become tender, painful, and produces all the clinical symptoms of a twisted pedicle. On opening the abdomen, there is no evidence of axial rotation. The surgeon should examine such a cyst carefully, for these signs are sometimes due to free intracystic bleeding.

Cyst-adenoma. (*Multilocular glandular cyst.*) This is a common variety, and some of the largest examples of ovarian cysts are of this type. Cystic masses filled with gelatinous stuff sometimes weigh eighty, one hundred, or more pounds. In their simple form these cystic masses are innocent, but there are varieties which exhibit malignant characters in a peculiar way. It happens occasionally that a loculus bursts, and the peculiar gelatinous contents of the cyst, which to the naked eye resembles jelly, escape into the belly, and as the glandular elements in the cyst-wall continue to secrete, this material accumulates and distends the abdomen. The surgeon opens the abdomen with the expectation of removing a tumour, and to his surprise finds the belly filled with gelatinous material: one who is acquainted with the condition immediately introduces his hand into the pelvis, finds the tumour, withdraws it, ligatures the pedicle, and removes as much as possible of the jelly and completes the operation. It is useless to attempt the removal of this gelatinous material by irrigation. On one occasion I removed from a woman's belly three gallons of inspissated jelly of this kind secreted by an ovarian cyst-adenoma no bigger than a coco-nut. Thirteen years later she was in good health. In contrast to this the following facts are important :—

I removed from a woman, aged 51, a cyst-adenoma the size of a football. Two years later she came under observation again with a tumour in the opposite ovary which had burst and filled the belly with gelatinous stuff. Six years later she came again to me with the abdomen enormously distended with jelly after this had been removed, I noticed that the peritoneal investment of the intestines and the organs generally were beset with a multitude of minute nodules. On microscopic examination these nodules contained active epithelium like that found in the cyst-adenoma These engrafted nodules had furnished the jelly. The woman reported herself three years later and was in good health. I then lost sight of her after observations extending over 13 years.

It occasionally happens that the vermiform process becomes distended with gelatinous material indistinguishable from that found in ovarian cyst-adenomas. Sometimes the distended process ruptures and the gelatinous material escapes into the abdomen, sometimes in large quantity. On three occasions I have found a vermiform process stuffed and distended with colloid material in women who had bilateral ovarian cyst-adenomas. These gelatinous cysts of the ovaries occur most commonly after the age of 40. They are usually bilateral. Among the pioneers of ovariotomy the effects produced by the extravasation of the gelatinous material on the omentum led them to describe the condition as colloid of the omentum, or colloid cancer. Among other names applied to it is Pseudomyxoma of the Peritoneum. Now we know the source of the material these fanciful names may be dropped with advantage.

Ovarian Dermoids. These common tumours of the ovary leak occasionally, spontaneously, from thinning and slow rupture of their walls, or the cyst-wall is sometimes burst by violence. This allows the sebaceous material which such cysts contain, as well as the shed hair and epithelium, to accumulate within the abdomen The surgeon will be puzzled when he encounters the condition for the first time. Lucy described a remarkable example An ovarian dermoid leaked and so filled a woman's belly with sebaceous paste that it pitted as if it were plastic clay when pressure was made upon it with the finger. He removed, at the operation, eleven pounds of pultaceous sticky stuff. A number of cases have been reported in which the epithelial material extruded into the abdominal cavity from ovarian dermoids has engrafted itself on to the peritoneum, so that when the surgeon opened the abdomen he was surprised to find the intestines and omentum beset with nodules, many of them furnished with a tuft of hair. These 'epithelial weeds' differ from secondary cancerous nodules in remaining as grafts on the peritoneum, they do not penetrate the underlying tissues, nor display invasiveness which is such a marked attribute of the cancerous nodule.

To dissemination of this kind I applied the term epithelial infection. In a recent case described by Randall and Laurence the leakage occurred from a hole caused by tapping the dermoid.

A much more serious condition faces the surgeon when he attempts to remove a malignant ovarian teratoma. These occur in infants, girls, and young women. The metastatic nodules contain epithelium, neuro-epithelium, skin, cartilage, nerve-ganglia, medullated nerves, &c. These tumours are very malignant, recur rapidly after removal, and destroy life in a few months.

It is believed by some writers that organs like mammæ sometimes

hernia, minus stercoraceous vomiting. Even fæcal vomiting does not always negative the existence of acute axial rotation of an ovarian tumour, for a loop of bowel is sometimes involved in the twist.

It is a matter which surprises the surgeon when he opens the abdomen expecting an acutely inflamed, or a perforated vermiform process, or an obstructed intestine, but finds a black mass which he gradually recognizes as an ovarian cyst which has twisted its pedicle.

A rarer complication is an ovarian cyst which has suddenly increased in bulk, and become tender, painful, and produces all the clinical symptoms of a twisted pedicle. On opening the abdomen, there is no evidence of axial rotation. The surgeon should examine such a cyst carefully, for these signs are sometimes due to free intracystic bleeding.

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operation was undertaken, the descriptions being based on post-mortem examinations.

The mortality among ovarian sarcomas in children submitted to operation is very high. In the collection of records referred to above, 7 of the 21 patients died, and of the 14 which recovered, I ascertained that 4 died with recurrence within a year of the operation. The youngest child on record who has been operated upon for sarcoma of the ovary was aged 33 months. She died a few hours after ovariotomy (Hoffman).

There is need of some new records in relation to sarcoma of the ovary in women. The careful observations which enabled the solid tumours of the ovary—ovarian fibroids—to be removed from the sarcoma group vitiates the older records. Previously all solid ovarian tumours were called sarcomas.

Papillomatous (Papilliferous) Cyst. This is an important species of ovarian cyst, because it often puzzles the beginner in pelvic surgery. In the early stage the papillomatous processes are strictly confined within the cyst, but as they grow, bud-like processes perforate the cyst-wall, irritate the peritoneum, and lead to hydroperitoneum. Sometimes the cyst is so stuffed with dendritic growths that the walls of the cyst burst, and the tumour has the appearance of a luxuriant cauliflower. Fragments of the epithelial processes are dispersed through the abdomen and infect the peritoneum.

It sometimes happens that the amount of free fluid in the abdomen is so great, that the surgeon, finding a luxuriant sprouting mass in the pelvis, hastily comes to the conclusion that the tumour is malignant, and closes the abdomen under that impression. This is unfortunate, for the removal of these papillomatous masses is, as a rule, attended with great advantage to the patient.

In 1906 a young woman was admitted into the Cancer Wards of the Middlesex Hospital with her abdomen so enormously distended with fluid that there was a cystic protrusion at each femoral ring, the inguinal canals, and the umbilicus. There was a recent median scar in the abdominal wall below the umbilicus. The patient had been operated upon by a gynæcological surgeon of repute, but he did not remove the cysts. The patient's condition was deplorable, so I reopened the abdomen and removed the papilliferous masses with the ovaries. She made a good recovery, left the hospital, and renewed her work as a dressmaker. She died five years afterwards with some obscure intra-thoracic condition.

One of the most remarkable examples of papillomatous cysts on record is described by Pye-Smith: A woman was tapped for hydroperitoneum between August 1884 and April 1894, 299 times. She was readmitted into Guy's Hospital for her 300th tapping and died. At the post-mortem

found within an ovarian dermoid may become the seat of malignant disease. Of this there is no proof, but ovarian dermoids, like other forms of ovarian cysts, may become the seat of implanted cancer (see p. 219).

Ovarian Fibroids. Tumours occasionally arise in the ovary which in their naked-eye and microscopic characters are indistinguishable from the common form of the hard uterine fibroid: they undergo similar degenerative changes, become cystic, and calcify. Ovarian fibroids are encapsuled tumours, and present smooth contours. They may be unilateral or bilateral, the former is more common. They are occasionally complicated with hydroperitoneum, and, except in this circumstance, they rarely produce any very obvious impairment of health. An ovarian fibroid has been observed as early as the nineteenth year, even at this early age it was calcified, and as late as the seventy-third year. A calcified ovarian fibroid has been known to obstruct labour (Soutar). There is every reason to believe that a fibroid may arise in the ovary long after the menopause; this distinguishes the ovarian from the uterine fibroid.

In 22 cases under my own care the youngest patient was 27, and the oldest 73. In one patient the tumour had a twisted pedicle, and in another the tumour complicated pregnancy. In three patients the tumours were bilateral and in two of them I removed the uterus also; they made satisfactory and permanent recoveries.

One of the difficulties connected with solid ovarian tumours, especially those called fibroids, has been the absence of after-histories concerning those patients who have been submitted to operation. This defect has been removed by the publications of Doran, Briggs, and Fairbairn. I followed up ten of my patients. Nine were alive at intervals varying from one to six years after the operation. One died three months after ovariotomy from a chronic affection of the lung and pleura.

The results of careful inquiries into the after-history of patients who have had ovarian fibroids removed, clearly prove that these tumours are as innocent as the common varieties of uterine fibroids. The immediate result of the removal of such tumours is excellent, even when they are associated with hydroperitoneum. The ovarian fibroid was formerly regarded as a sarcoma.

Sarcoma of the Ovary. The ovaries, like other paired organs, are prone to become the seat of sarcoma in early life. Some years ago I collected a hundred recorded cases of ovariotomy in girls under 15 years of age. Of this series, 41 were simple cysts or adenomas; 38 were dermoids; and 21 sarcomas. This, however, is far short of the real proportion of sarcomas, because there are many records in which no

The opposite ovary contained a papillomatous cyst, and in addition each ovary was occupied by a dermoid as big as an orange. The patient recovered, and was in good health eight years afterwards, and free from any evidence of recurrence.

Carcinoma of the Ovary. When a woman is attacked by cancer in the gastro-intestinal tract, gall-bladder, breast, or uterine tube, the cancerous cells permeate the adjacent tissues and escape into the abdominal cavity, and floating in the peritoneal fluid find their way into the pelvis. If the woman be so unlucky as to have an ovarian cyst or dermoid in the pelvis, the cells deposited on the cyst-wall will engraft themselves and grow into blocks of cancer. Many large solid tumours of the ovary, unilateral and bilateral, which exhibit the structure peculiar to cancer and formerly regarded as arising primarily in the ovary, are in truth secondary to cancer in some other organs. The relationship of the ovarian masses to the primary cancer is demonstrated by the fact that the minute structure of the tumour in the ovary varies according to the situation of the primary tumour. Malignant metastatic masses of this kind are known as Implantation Cancer. The subject is of great importance to the surgeon, for when he undertakes an operation for the removal of solid or semi-solid tumours of the ovary, especially when bilateral, and accompanied by vomiting, it is incumbent on the surgeon to make a careful examination of the gastro-intestinal tract and the gall-bladder. In many of these cases a cancerous focus will be found at the pylorus, in the cæcum, or sigmoid colon. Implantation cancer of the ovary secondary to a cancerous breast is sometimes a mass as big as the patient's head.

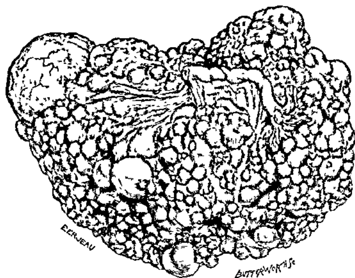


FIG 93. SECONDARY CANCER OF THE OVARY. An ovary converted into a solid mass of cancer secondary to a focus in the sigmoid colon: it weighed 5 lb. Two-fifths size.

On opening an abdomen and finding one or both ovaries enlarged by metastatic cancer, it is the duty of the surgeon to make a careful search for a primary focus, and if it be inoperable, it would be unwise to continue

examination a papillomatous cyst was found in connexion with each ovary. These cysts could have been easily removed. The peritoneum was beset with warts. Even when the peritoneum is covered with warts operative interference does good, and the sprouting epithelial processes disappear after the main masses are removed.

I have removed many papillomatous cysts with good consequences during the past twenty-five years and most of them have made complete and durable recoveries. In a few cases I have removed the uterus also. In two cases the growth recurred in the pelvis five years after the primary operation. I operated again and found a large cyst as big as a coco-nut unconnected with the pelvic structures. In each instance it was easily *enucleated and the patients recovered.*

The most remarkable case in my series is the following: I removed from a woman a pair of papillomatous ovaries and the uterus. There was an abundant hydroperitoneum, and the pelvic portion of the peritoneum was beset with soft dendritic warty masses. The patient recovered, but came under my care six years afterwards with a soft tumour growing from the right side of the sternum, level with the second intercostal space. The tumour was soft and movable. The tumour was as big as a ripe plum. I excised it and found the lump to be cystic and stuffed with soft papillomatous processes such as occurred in the ovaries. On careful examination I failed to find any other evidence of recurrence in the abdomen or thorax.

Pozzi has reported a case in which a papillomatous mass recurred in the pelvis 20 years after bilateral ovariotomy for this disease. He holds the opinion that it is a great advantage to operate on recurrent tumours of this kind, as it is attended with distinct advantage to the patient even when the tumour cannot be completely removed.

The experience of surgeons in connexion with papillomatous cysts of the ovaries teaches that the presence of free fluid in the belly in association with a pelvic tumour, although a suspicious, is not always a sinister sign, and it is wise to give the patient the benefit of an operation. Papillomatous cysts sometimes attain a great size without bursting.

I removed an enormous example from a spinster, aged thirty-three. The tumour had been noticed for fifteen years, and at last it became so cumbersome that she insisted on its removal. She had been allowed to retain it so many years under the impression that it was a cystic uterine fibroid. The tumour was exposed by incision extending from the ensiform cartilage to the pubes. It could not be extracted entire even through this long incision, but after two gallons of fluid had been run off the tumour slipped out. It proved to be a unilocular papillomatous cyst weighing seventy pounds and the cyst-wall was covered with dendritic warts.

ovariotomy; this, and the prolonged manipulation, is often responsible for severe shock.

Spurious capsules. It is necessary for the surgeon to remember that an ovarian cyst, and especially an ovarian dermoid, is sometimes invested by a spurious capsule. It is now well known that slow effusions of blood, tuberculous exudations, hydatid cysts, and ovarian cysts become enclosed in capsules of fibrous tissue formed by the organization of the peritoneal exudation which their presence excites. These capsules are often so firm, and so completely encyst the fluid exuded into the pelvis in cases of tubal tuberculosis, that such encapsuled collections of fluid resemble, and are often mistaken for, ovarian cysts. It is also necessary to mention that true ovarian cysts project from, but never invade, the layers of the broad ligament. From time to time cases are reported in which ovarian cysts, especially dermoids, have been found between the layers of the broad ligament: such are in all probability instances in which a false capsule has formed around the cyst, and the surgeon committed an error of observation in regarding it as a layer of the broad ligament.

Incomplete Ovariotomy. The surgeon may start an operation and, after opening the abdomen, may find many adhesions, yet he feels that the removal of the tumour is possible. He sets to work and overcomes many of the difficulties, but finds at last such extensive pelvic adhesions that it is imprudent to proceed further. In such cases he evacuates the contents of the cyst and stitches the edges of the opening in the cyst to the margins of the abdominal wound, and drains the cavity. This mode of dealing with a cyst is usually termed 'incomplete ovariotomy'.

An incomplete ovariotomy is a very different operation from an enucleation. The cavity left after enucleation closes completely, but when the wall of an ovarian cyst or adenoma is left the tumour gradually grows again, or it may suppurate so profusely that the patient slowly dies exhausted. There are few things sadder in surgery than the slow, miserable ending of an individual who has been subjected to an incomplete ovariotomy.

Anomalous ovariotomy. In a few instances, generally under an erroneous diagnosis, surgeons have removed ovarian tumours through an opening other than the classical one known as the median sub-umbilical incision. Under the impression that the tumour was splenic, an ovarian tumour of the right side has been successfully removed through an incision in the left linea semilunaris (R. W. Parker). An ovarian tumour, supposed to be a renal cyst, has been successfully extracted through an incision in the ilio-costal space (Le Bec). Strangest of all, a small ovarian

the operation. Occasionally the implantation masses are so big and cause so much distress that it adds to the patient's comfort to remove them. When the primary focus is a small contracting cancer in the colon, especially in the sigmoid colon, or near the ileo-colic valve; it may be easily missed.

A study of the after-results of ovariotomy shows that many patients have died some months after the operation from intestinal obstruction. The new knowledge indicates that many were, in all probability, primary cancers overlooked in the course of the ovariotomy.

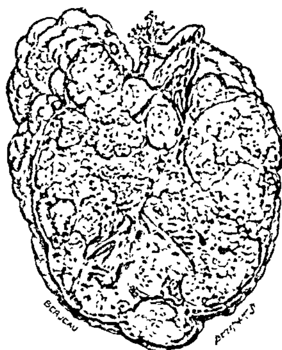


Fig. 94. Secondary Cancer of the Ovary in Section This is a section of the ovary represented in the preceding figure. Half size.

Cysts of the broad ligaments. Occasionally the surgeon on opening the abdomen finds that the cyst or tumour is situated between the layers of the broad ligament. Sessile cysts of this kind are removed by what is known as enucleation. The peritoneum overlying the cyst is cautiously torn through with forceps until the cyst-wall is exposed; then by means of the forefinger the surgeon proceeds to shell the cyst out of its bed, taking care not to tear the capsule or any large vein in its wall; it is also necessary to exercise the greatest care to avoid injury to the ureter. It is not uncommon, after enucleating a cyst in this way, to find the ureter lying at the bottom of the recess. (For treatment of an injured ureter see Vol III)

When the enucleation is completed the walls of the capsule are carefully examined for oozing vessels which require ligature. The capsule can often be closed in such a way as to bring its walls into apposition and thus obliterate its cavity; it then requires no further attention. When there is much oozing the capsule is treated on the plan known as marsupialization. The edges of the capsule are brought to the lower angle of the abdominal wound and secured with sutures, and a drain, either of gauze or a rubber tube, is introduced, and the remainder of the wound closed in the usual manner.

Enucleation is usually accompanied by more loss of blood than simple

tabulated one hundred instances in which ovariotomy had been performed in infants and girls under fifteen years of age. These tumours fall into three groups:

Simple cysts and cyst-adenomata .	41 with	3 deaths.
Dermoids	38 "	5 "
Sarcomata	21 "	7 "

In the case of simple cysts, adenomata, and dermoids, the results are encouraging. It is possible that some of the cases described as sarcomata belonged to the deadly group now known as malignant teratomata.

Ovarian tumours sometimes attain large dimensions in children, and Keen reported a case in which he removed an ovarian tumour from a girl which weighed 44 kilograms: the girl weighed 27 kilograms after the operation. An ovarian cyst with a twisted pedicle has been found in a fœtus at birth (Otto von Franque).

The subjoined table shows cases in which ovarian tumours have been removed from infants under three years of age. It is often stated that Professor Chiene performed ovariotomy on an infant of three months. This is an error; it was an ovary occupying the sac of an inguinal hernia.

OVARIOTOMY IN INFANTS

	Reporter	*Age*	*Result*	*Nature of Tumour*	*Reference*
1	D'Arcy Power	4 months	R.	Dermoid	*Trans Path Soc*, xlix. 186.
2	MacGillivray	11 months	R.	Cyst	*Lancet*, 1907, i. 1487.
3	Roemer	1¾ years	R.	Dermoid	*Deutsche Med.Woch*, 1883, ix. 762.
4	Péan	2 years	R.	Dermoid	*Clin. Chir*, 1887–8, 8th series.
5	Hooks	2½ years	D.	Dermoid	*Am. J. of Obst.*, 1886, xix. 1022.

Ovariotomy in old age. In 1891 I was able to find twenty-two records of successful ovariotomy in women over seventy years of age. Since that date Howard A. Kelly and Mary Sherwood made a collective investigation, and succeeded in obtaining notes of one hundred cases of ovariotomy performed on women over seventy years of age: the death-rate amounted to 12 %

The subjoined table concerns itself with ovariotomy performed on women after the age of eighty years, and the results are remarkable, notwithstanding the circumstance that these women of eighty years and upwards must have been blessed with a stronger constitution than their contemporaries.

dermoid has been removed through the rectum under the impression that it was a polypus of the bowel (Stock, Peters).

Hysterectomy after Bilateral Ovariotomy. After the removal of both ovaries for cysts or tumours, the uterus is a useless organ: it is fast becoming the practice under such conditions to remove it. There is much to be said in favour of this procedure, especially if the uterus be large and flabby, because it tends to fall backwards into the pelvis. In such circumstances it is better surgery to remove it than to perform hysteropexy. The risk of intestinal obstruction after bilateral ovariotomy is greater than after hysterectomy. Cases are known in which cancer has attacked the uterus years after bilateral ovariotomy and oöphorectomy (see p. 140).

Repeated Ovariotomy. Very many cases are known in which women have been twice submitted to ovariotomy. Thus it is the duty of the surgeon when removing an ovarian tumour to examine carefully the opposite ovary. So many examples are known of women who have borne children after unilateral ovariotomy (twins and even triplets) that this alone is sufficient to prohibit the routine ablation of both glands.

A second ovariotomy is not attended with more risk than a first ovariotomy. The abdominal incision must be made with extra caution, because intestine may be adherent to it and runs a risk of being wounded. In some instances the cicatrix is very thin, and the surgeon cutting through it is liable to cut the intestine before being aware that the knife has entered the abdomen.

Some surgeons recommend that in a second ovariotomy the opening may with advantage be made a little to one side of the original incision.

Cases have been reported in which patients have been thrice submitted to ovariotomy: in such instances it is probable that one of the tumours was a sessile broad-ligament cyst.

Pregnancy after Bilateral Ovariotomy. It is an interesting fact that several cases have been carefully reported in which women who have had bilateral ovariotomy have subsequently become pregnant. This event has been explained by assuming that in some of the patients a portion of at least one ovary has been left. This meets with more favour than the idea of the existence of a supernumerary ovary. The cases have been collected by Doran.

Ovariotomy at the extremes of life. Cysts and tumours arise in the ovary during intra-uterine, and at all periods during extra-uterine life, even in extreme old age: they also attain such dimensions in infants and old women as to demand the aid of the surgeon, and with excellent results. Many years ago I collected the recorded cases and

tabulated one hundred instances in which ovariotomy had been performed in infants and girls under fifteen years of age. These tumours fall into three groups:

Simple cysts and cyst-adenomata	41 with 3 deaths.	
Dermoids	38 ,, 5 ,,	
Sarcomata	21 ,, 7 ,,	

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The subjoined table concerns itself with ovariotomy performed on women after the age of eighty years, and the results are remarkable, notwithstanding the circumstance that these women of eighty years and upwards must have been blessed with a stronger constitution than their contemporaries.

OVARIOTOMY IN WOMEN OF EIGHTY YEARS OF AGE

	Reporter	*Age*	*Result*	*Reference*
1	Owens	80	R.	*Brit. Gyn. Soc. Journal*, iv. 88.
2	Richardson	80	R.	*Brit. Med. Journ.*, 1894, i. 523.
3	Heywood Smith	81	R.	*Lancet*, 1894, i. 1618.
4	Spencer	82	R.	*Brit. Med. Journ.*, 1893, ii. 1271.
5	Homans	82	R.	*Bost. Med. and Surg. Journ.*, 1888, 454.
6	Edis	81	R.	*Brit. Med. Journ.*, 1892, i. 860.
7	Bush	84	R.	Ibid., 1894, ii. 67.
8	Remfrey	83	R.	*Trans. Obstet. Soc.*, xxxvii. 152.
9	Kraft	84	R.	*Hospitalstidende*, Copenhagen.
10	Owens[1]	87	R.	*Lancet*, 1895, i. 542.
11	Thornton	94	R.	*Trans. Obstet. Soc.*, xxxvii. 158.
12	Bland-Sutton	85	R.	Middlesex Hospital.

Mortality. The death-rate after ovariotomy is hard to estimate, especially as surgeons differ widely in their mode of classifying the tumours. In the simple and uncomplicated forms of ovarian cysts and tumours the operation should be almost free from risk. Many surgeons, excluding malignant conditions, have had lists of a hundred operations with no deaths.

In order to afford some notion of the relative frequency of the various cysts and tumours classed as ovarian, I made a list of one hundred consecutive examples which I removed at the Chelsea Hospital for Women:

Fibroids	2	Dermoid	15
Sarcoma	2	Papillomatous cyst	2
Carcinoma	1	Parovarian	5
Simple Cyst	45	Tubo-ovarian	3
Cyst-adenoma	25		

The case of carcinoma was an implanted cancer; the primary tumour arose in the pyloric region of the stomach, both ovaries were implicated. The three cysts classed as tubo-ovarian were probably large examples of hydrosalpinx: one was so big that it came in contact with the liver.

In order to estimate the risks of ovariotomy fairly the nature of the tumour must be considered. In the preceding edition of this book the general mortality of ovariotomy was given in the following terms:

'If all kinds of tumours are included, a 5 % mortality in experienced hands would be regarded as a good result. In general hospital work it is probably as high as 10 % With less experienced surgeons who do not perform many pelvic operations the death-rate will vary from 10 to 15 %.'

In order to make matters more precise I examined the surgical and gynæcological reports of the Middlesex Hospital for 1909, 1910, and 1911

[1] A second operation on patient No 1 in the list.

During that period 120 operations were performed under the general heading of ovariotomy. The tumours are given in the subjoined table, which shows also the number of deaths from operation.

		Deaths.
Simple cysts and cyst-adenomas	93	3
Dermoids	12	0
Ovarian fibroids	4	0
Papillomatous cysts	2	0
Parovarian	1	0
Malignant	8	2
	120	5

The perusal of such a list can only give a general idea of the results of ovariotomy. Some of the cysts had burst: several had twisted their pedicles: many of the cysts were bilateral, entailing the removal of both ovaries, and in a few cases the uterus also. The malignant tumours were in all probability metastatic carcinomas. Apart from these conditions, the table furnishes evidence of the success attained by a number of surgeons differing in experience and ability, working together under similar conditions in a general hospital in London, which receives acute as well as chronic cases of ovarian disease.

The risks and after-consequences of ovariotomy are set forth in pp. 13 *et seq.*

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CHAPTER II

OÖPHORECTOMY

Oöphorectomy signifies the removal through an abdominal incision of an ovary and uterine tube for affections mainly inflammatory.

The evolution of this operation is of great interest to surgeons. Removal of the ovaries as a surgical operation was introduced independently by Hégar in Germany and Battey in Georgia, for the relief of pelvic pain and dysmenorrhœa, in 1872. In the same year Lawson Tait performed his pioneer operation and removed an ovary and tube for the relief of pain due to disease of the ovary. Subsequently he advocated bilateral oöphorectomy for the purpose of inducing an artificial menopause in women with uterine fibroids. From these beginnings the operation began to be performed for the relief of a variety of conditions connected with the generative organs, such as—

Pyosalpinx and tubo-ovarian abscess, hydrosalpinx, tuberculous ovaries and tubes, sarcoma and carcinoma of the uterine tubes, gravid uterine tubes, ovarian abscess, ovarian pregnancy, prolapse of the ovary; finally bilateral removal of the ovaries has been practised for the relief of inoperable cancer of the breast.

Bilateral oöphorectomy is occasionally performed for osteomalacia (a rare disease in Great Britain), as it arrests pain and the excessive output of phosphates in the urine, which is a marked feature of this affection. This extension of the operation we owe to Fehling of Bâle (1887).

Time and experience have considerably modified surgical opinion in regard to oophorectomy. Removal of the ovaries is no longer practised for the relief of hæmorrhage due to fibroids: it is easier, safer, and affords greater relief to the patient to remove the uterus. When dysmenorrhœa is so severe as to need radical operation, hysterectomy is the only certain method, with conservation of at least one ovary. The removal of both ovaries in certain forms of insanity is now abandoned, and this is true of bilateral oöphorectomy for the relief of mammary cancer.

In other directions the operation has undergone extension, for in some chronic diseases of the uterine tubes it is difficult completely to extirpate the affected tissues without removing the uterus. These will be considered in describing the actual opera

Apart from the many modifications in the details of the operations, some surgeons prefer to remove the ovaries and tubes through an incision in the vaginal fornix. This is known as Colpotomy, or Vaginal Cœliotomy

Some writers attempt to subdivide the various modifications of oöphorectomy and apply to them special terms: for example, the removal of the ovary and tube would be termed salpingo-oöphorectomy. Removal of the tube would be called salpingectomy, and the excision of the ovary, oöphorectomy. This terminology may be precise, but it is certainly clumsy. A few writers designate these operations as 'removal of the uterine appendages'; this phrase, though comprehensive, is neither precise nor elegant.

Operation. The patient is prepared in the same manner, and the same instruments are required, as for ovariotomy. In these operations the Trendelenburg position is of the greatest advantage.

In a case of prolapse of the ovary, or a gravid tube or ovary in the earliest stages, the operation presents no difficulty and can be carried out with the ease and safety of the simplest ovariotomy; but there are many cases where the tubes and ovaries contain pus and are distended into cysts as big as a fist, or even as large as the patient's head, which are adherent to bowel, uterus, bladder, indeed everything with which they come in contact; this renders their removal tedious and exacting for the surgeon and dangerous to the patient. Although a suppurating ovarian cyst adheres to surrounding organs, its removal is simpler than in the case of a large pyosalpinx, because the uterine tube is intimately enclosed within the folds of the broad ligament, and these connexions serve to bind it firmly in the pelvis.

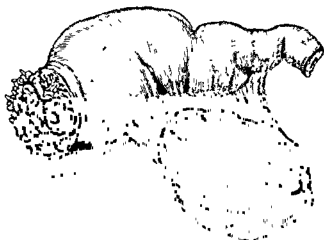


FIG. 95 AN INFECTED UTERINE TUBE. The cœlomic ostium of the tube is unoccluded and is in the process of slowly engulfing the fimbriæ. *Removed from a woman in the acute stage of* salpingitis. Three-quarter size.

In undertaking the removal of enlarged tubes the surgeon's first duty is to expose the parts by a free incision, and then carefully isolate the intestines and upper parts of the abdomen with dabs in order to prevent them from being contaminated with pus. He will quickly recognize, in the majority of cases, that he has to deal with tubal disease, because

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In other directions the operation has undergone extension, for in some chronic diseases of the uterine tubes it is difficult completely to extirpate the affected tissues without removing the uterus. These will be considered in describing the actual operation.

In acute salpingitis the abdominal ostia of the tubes are open and pus can be seen leaking from them. In chronic cases the ostia are closed. When dealing with a case suspected to be acute salpingitis the surgeon must remember that his diagnosis is not infallible, and though the signs appear to indicate leakage from an infected tube, the trouble may be due to rupture of a gravid tube or an ovarian cyst, perforation of an infected vermiform process, or a calculus impacted in the lower segment of a ureter.

It is the common practice in cases of acute pelvic peritonitis when the uterine tubes are found enlarged and pus leaks from their abdominal ostia, to remove them. Since it has been established that gonococcal peritonitis is rarely fatal, I have tried milder measures. Instead of removing the ovaries and tubes, I wash them with warm sterile water and also the recesses of the pelvis, and then drain with a rubber tube for a few days, perhaps a week. The immediate results of this method are excellent.

The operative difficulties in chronic salpingitis are caused by adhesions of the tubes and ovaries to adjacent viscera. The most serious complication in removing a large pyosalpinx, especially on the left side, is a firm adhesion to the rectum ; this may be occasionally anticipated when the patient gives a clear history of one or more sudden discharges of pus from the anus. An accidental tear of the rectum through comparatively healthy tissues may be repaired by interrupted sutures, but when the injury is in tissues altered by chronic suppuration, the only course open to the surgeon is to drain with a wide rubber tube, and it is surprising as well as gratifying to know that a fistula of this kind, low in the rectum, will often close in a week or ten days. It is important to bear in mind that an undetected tear into the rectum, if the abdomen be closed without drainage, will, in all probability, lead to fatal peritonitis.

It has happened that a surgeon in removing a pyosalpinx tore a hole in the rectum ; he was unaware of the accident, and a few hours after the operation ordered 10 ounces of saline solution to be injected into the bowel. This fluid passed through the rent in the gut direct into the pelvis with fatal consequences.

After removing the diseased parts and securing the large vessels directly concerned in the pedicles, attention is directed to the oozing from the torn tissues in the floor of the pelvis. Any vessel which is bleeding should be ligatured with thin silk, and then the recesses of the pelvis may be firmly plugged with a dab wrung out of hot water : this is a valuable measure of hæmostasis. This dab is removed in two or three minutes, and any vessel which is bleeding quickly seen and ligatured.

the distended uterine section of the tube will lie on the more globular lateral portion of the tube and assume the familiar shape of a chemical retort. With the fingers the adherent omentum and bowels are carefully detached, and the adhesions between the distended tube or ovary and the rectum are carefully broken through with the finger, and the parts withdrawn from the pelvis. With great care it is usually possible to do this without bursting the tube. When the tube bursts in the process of removal it is useful to swab it up with some strips of gauze and thus keep the 'dabs' clean for the final stages.

As soon as the diseased parts are extracted, a dab is pressed into the pelvis to check the oozing: the pedicle is clamped with forceps and the tube and ovary detached.



FIG 96. A TUBERCULOUS UTERINE TUBE AND OVARY: ENTIRE AND IN SECTION. Caseous matter has exuded through the cœlomic ostium of the tube and become encapsuled. Natural size

It is the common practice in dealing with inflamed and septic ovaries and tubes to transfix and ligature the pedicles as in a simple clean ovariotomy. The consequences of this practice are not satisfactory, for the pedicles being infected often give rise to trouble, because the silk acts as a seton, an abscess forms which may burst through the abdominal wound, the rectum, or the bladder, and leads to the establishment of a sinus which persists for many months until the ligature is extruded. There are several methods of avoiding this: for example, the arteries in these broad pedicles may be ligatured separately with thin silk, and the edges of the peritoneum drawn together by two or three mattress sutures (Fig 49, p. 107).

When the uterine tube is thickened quite up to the uterine extremity, it may be exsected from the uterus: in such a case the uterine artery will be tied and the flaps at the uterine end can be brought into apposition by a mattress suture.

becoming infected from intestinal ulcers or the bursting of a tuberculous gland. The infective material being carried by the lymph currents of the abdomen into the mouths of the uterine tubes.

Actinomycosis (Streptothrix infection). This disease attacks the uterine tubes and also the ovary. A critical consideration of the published cases supports the contention that the disease is secondary in these situations and that it spreads to the tube and ovary from the intestinal tract and especially the vermiform process. In all the reported cases the intestines were firmly adherent to the infected tube. The clinical features of the disease and the macroscopic appearances resemble tuberculous salpingitis.

One of the earliest observed examples of actinomycosis of the uterine tube was described by Zemann (1883). Since then more than a score of cases have been observed in Europe. Risel and Wagner have collected the literature.

RISEL. *Zeitschr. fur Geburtsh. und Gyn.*, 1905, lvi. 155.
WAGNER, C. *Surg. Gyn. and Obstet.*, 1901, x. 148.
ZEMANN. *Med. Jahrbücher*, 1883, 477.

Abdominal hysterectomy after bilateral oöphorectomy and ovariotomy. After the complete removal of the ovaries and tubes the uterus is a useless organ, and when the 'appendages' have been removed for inflammatory lesions, acute or chronic, it may become a troublesome organ. In some instances a uterus devoid of its appendages has been attacked by cancer. In a few instances in which patients have undergone bilateral oöphorectomy, or bilateral ovariotomy, successful conception has followed the operation (see p. 222).

The most annoying consequences which follow bilateral oöphorectomy for salpingitis, acute or chronic, are hæmorrhage, pain, or a purulent discharge. Every surgeon with an ordinary experience of this class of surgery has probably had to remove the uterus on several occasions as a sequel to bilateral oöphorectomy. Many surgeons, when they find the appendages so hopelessly diseased that they must be removed, perform subtotal hysterectomy at the same time. My own practice in this matter is to perform subtotal hysterectomy when it is necessary to remove the uterus as well as the appendages in chronic disease; and total hysterectomy when it is deemed advisable to remove the uterus with the appendages in acute infective conditions. The reasons for this modification are obvious, because in chronic conditions there is little liability for the stump to become infected, for experience teaches that though the distended tubes contain pus in chronic cases, yet on bacteriological examination this pus

In cases where the enucleation of adherent and inflamed tubes leaves large raw and slightly oozing surfaces in the pelvis, drainage is a wise precaution. After a trial of a variety of measures for this purpose I find the simplest to be a narrow rubber tube reaching to the bottom of the pelvis and emerging at the lower extremity of the abdominal incision. It is rarely required for more than forty-eight hours. Some surgeons are opposed to drainage, and one writer compares it to 'defending oneself against the sparks of Vulcan with an umbrella'; his mortality is high.

In simple cases the incision is closed according to the method described on p. 212; but after the removal of suppurating ovaries and tubes it is better to unite the wound by a single layer of sutures through all the tissues of the abdominal wall: buried sutures in such conditions nearly always give trouble.

BACTERIOLOGY OF THE UTERINE TUBE IN RELATION TO OPERATIONS

A large amount of labour has been expended on investigating the bacteriology of infective diseases of the uterine tubes. The chief varieties of micro-organisms found in them are the gonococcus, streptococcus, the tubercle bacillus, and very rarely a streptothrix.

The gonococcus attacks mainly the mucous membrane of the tubes and is more destructive to function than to life; extensive pelvic operations are often performed for damage it causes to the uterus and tubes, sometimes in the acute, but more often in the chronic stages of the infection.

Thrombosis and pulmonary embolism are not sequences of gonorrhœal infection. The gonococcus causes great irritation of tissues, and produces masses of adhesions but does not coagulate blood.

The streptococcus and the colon bacillus are occasionally found in old-standing cases of pyosalpinx and are usually secondary infections. When the streptococcus occurs primarily in a pyosalpinx the condition is a sequel of septic puerperal infection of the uterus, or of an operation. The streptococcus flourishes best in loose connective tissue, invades blood-vessels and lymph-vessels. It is a virulent micro-organism especially destructive to life.

The colon bacillus finds its way into distended tubes when they adhere to adjacent coils of bowel, especially the rectum.

Tuberculosis of the tubes is usually a descending infection and the tubercle bacillus finds its way into the tubes in an indirect way. The infection, in many cases, is primary in the intestine, the peritoneum

in the cases first reported was oöphorectomy, but in the majority of patients the disease quickly returned and destroyed them in a few months.

It subsequently became the practice to remove the uterus as well as the tubes and ovaries, but a quick recurrence in these circumstances is the rule.

The really favouring factor in the case is the condition of the cœlomic ostia of the tubes. When these remain open, the cancerous cells escape freely and implant themselves on the pelvic peritoneum and adjacent organs. In very rare instances the cœlomic ostia are occluded: in this happy circumstance a fairly long freedom from recurrence may be hoped for.

The relation between the condition of the abdominal ostium of the uterine tube and the recurrence of cancer is illustrated by the following cases:—

A woman, fifty-seven years of age, had a large submucous fibroid in the uterus and cancer of the left tube. At the operation the abdominal ostium was not only patent, but the carcinoma protruded through it and nodules of growth could be seen on the wall of the rectum at the point where the tube rested on the bowel. The patient recovered from the operation and enjoyed good health for eleven months, then signs of recurrence became manifest and she died a few weeks later.

A woman, forty-nine years of age, had a large fibroid in her uterus and a uterine tube stuffed with cancer, but the abdominal ostium was completely occluded. The uterus, ovaries, and tubes were removed. The patient subsequently re-married and was in good health three years later.

Primary cancer of the uterine tube is often bilateral and its association with fibroids of the uterus unusual. A cancerous tube may lead to complications with an ovarian cyst. Our knowledge of primary cancer of the uterine tube has grown up within the last twenty years, and some of the recorded cases puzzled the reporters because the disease was associated with a cyst, sometimes of large size.

The specimen represented in Fig. 97 is instructive; it is an ovarian cyst complicated with cancer of the corresponding uterine tube. The cyst is as big as a coco-nut. The ampulla of the tube is stuffed with cancer, but the ostium is patent and a 'stream' of cancerous material has flowed over the wall of the cyst. In addition, the cancerous material has infiltrated the wall of the ovarian cyst. The patient recovered from the operation, but a year later she had an extensive recurrence.

The fact that cancerous cells retain their vitality in the peritoneal fluid, and are able to engraft themselves on the intestines, uterus, ovary, and parietal peritoneum, is an interesting fact. Glendinning has made some valuable observations in relation to cancer of the gastro-intestinal tract

is sterile. In the acute cases the pus swarms with micro-organisms—bacillus coli, staphylococcus, and occasionally streptococcus; these infect the stump, set up suppuration, infect the ligatures, and establish a chronic sinus. To cure this condition it is necessary to remove the stump by the vaginal route.

In cases of tuberculous infection of the uterine tubes it is not necessary to remove the uterus unless it is obviously implicated by the disease. In several patients I have left an ovary without any subsequent ill consequences.

Mortality. In order to estimate the risks of oöphorectomy it is necessary to classify the heterogeneous conditions for which this operation is required. In the majority of cases the chief cause is inflammatory (septic) affections of the uterine tubes; other causes are tubal and ovarian pregnancy, and prolapse of the ovary. Tubal pregnancy is considered in a separate chapter, and as prolapse of the ovary is so often associated with retroflexion of the uterus it is dealt with in the chapter on Hysteropexy.

In order to give some notion of the relative frequency of the infective conditions of the tubes and ovaries usually classed in Hospital Reports as 'diseased uterine appendages', I chose one hundred consecutive operations from my case reports at the Chelsea Hospital for Women. They are classed thus

Salpingitis	49
Pyosalpinx	31
Hydrosalpinx	10
Tuberculous	8
Ovarian abscess	2

In order to give some idea of the risks of unilateral and bilateral oophorectomy, I gathered the following facts from the Hospital Reports, prepared by the Registrar. During the years 1903–7 (both years inclusive) the staff performed the operation of oöphorectomy for diseased uterine appendages on 287 women. Of these four died. During the thirteen years I have filled the post of surgeon to this hospital I have performed on an average twenty oophorectomies yearly for the diseased conditions set forth in the above table. I lost one patient during the whole of this period, and that was in 1902. The chief risks of oöphorectomy for inflammatory conditions are undetected injury to bowel, especially the rectum, and septic peritonitis when the streptococcus is present in the tubes in acute cases.

Operation for primary cancer of the uterine tube. This disease is rarely diagnosed before operation. The treatment adopted

CHORION-EPITHELIOMA OF THE TUBE AND OVARY

This malign disease attacks the uterine tubes. Rossier in describing a case collected those previously reported. The symptoms of this disease resemble those of tubal pregnancy: these subside and there is a period of quiescence followed by rapid increase in the size of the tumour, accompanied by pain and severe constitutional disturbances. Operative treatment of the disease is attended by a high mortality and, in those who recover, quick recurrence and death is the rule. Bazy, in describing an unsuccessful case, reviews the results. Phillips has recorded a happy exception (1911).

Fairbairn has described an example of primary chorion-epithelioma of the ovary (1909). The woman was reported to be in good health two years after the operation.

BAZY, L. Carcinome placentaire ou chorio-épithéliome malin de la Trompe. *Annales de Gynéc. et d'Obstét.*, 1913, x. 207.

DORAN, A. A Table of Over Fifty Complete Cases of Primary Cancer of the Uterine Tube. *Journ. of Obst. and Gyn. of the Brit. Empire*, 1904, vi. 285.

—— Primary Cancer of the Fallopian Tube. Ibid., 1910, xvii. 1.

FAIRBAIRN, J. S. Primary Chorion-epithelioma of the Ovary. Ibid., 1909, xvi. 1.

FONYÓ, J. Über das primäre Tubenkarzinom. *Zentb. f. Gynak.*, 1913, No. 36, 1317.

GLENDINNING, B. The Spread of Carcinoma by the Uterine Tube. *Arch. of Middlesex Hosp.*, xix. 82.

PHILLIPS, M. H. A case of Chorion-epithelioma of the Uterine Tube. *Journ. of Obstet. and Gyn. of the Brit. Empire*, 1911, xx. 299.

ROSSIER, G. Ein Fall von Chorion-epithelioma malignum der Tube infolge Extra-uterin-Schwangerschaft. *Arch. fur Gyn.*, 1912, Bd. xcvii, 1913. Fehlings Festschrift.

infecting the tubes. I removed two ovarian cysts infected with cancer; the primary focus of the disease was in the stomach. To the naked eye the uterine tube appeared normal, but, on microscopic examination, cancerous particles were found by Glendinning free in its lumen; the subepithelial and plical folds were extensively infiltrated with cancer. From a careful consideration of this and some similar cases, Glendinning came to the not unreasonable conclusion that the uterine tube was

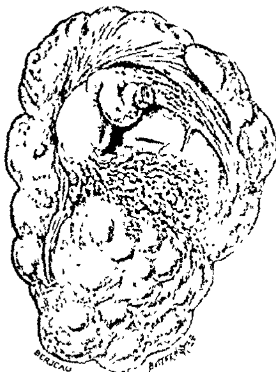


Fig. 97. Primary Cancer of the Uterine Tube. An ovarian cyst associated with primary cancer of the corresponding tube. The cœlomic ostium of the tube is open and the cancerous material has leaked out on to the cyst-wall. Half size

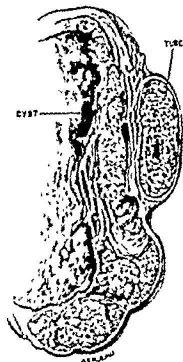


Fig. 98. A Section of Primary Cancer of the Uterine Tube. This is the cyst-wall and cancerous tube represented in the preceding drawing: it shows the cancerous infiltration of the cyst-wall. Half size.

infected by cancerous cells swept into it through the abdominal ostium, engrafting themselves on the mucous membrane and subsequently penetrating to the deeper tissues

These facts have even a deeper significance. Cancer of the uterine tube is often bilateral, and it is a disease which gives bad results to operative interference. The observations mentioned above permit the inference that some cases of unilateral and bilateral cancer of the uterine tubes are really examples of implanted cancer, and the primary focus may be situated in the gall-bladder, stomach, or some part of the colon.

SECTION IX

OPERATIONS UPON THE UTERINE TUBES

BY

W. BLAIR BELL, M.D., B.S. (Lond.)
Gynæcological Surgeon, with charge of Out-patients, Royal Infirmary, Liverpool

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CHAPTER I

GENERAL CONSIDERATIONS CONCERNING OPERATIONS ON THE UTERINE TUBES

GENERAL INDICATIONS FOR OPERATION

OPERATIONS on the uterine tubes are performed in the treatment of the following conditions :—

1. Abnormalities ;
2. Displacements ;
3. Ectopic gestation ;
4. Infections ;
5. Neoplasms.

GENERAL POINTS IN TECHNIQUE

Method of access. In all operations on the uterine tubes access should be obtained by means of laparotomy. The vaginal route should not be used for operations on the tubes, although it is sometimes advisable to drain a tubal or peritubal abscess through the posterior vaginal fornix previously to an operation being carried out on the tubes themselves.

Some gynæcological surgeons do operate by the vaginal route, but in the opinion of the writer this is a bad practice and is not in the best interests of the patient, since the proper method of dealing with the lesion present can often be decided only when a full view of the pelvis has been obtained.

The preparations for operation, both in regard to the patient and to the details connected with the performance of it, are those ordinarily employed for abdominal procedures (see Sec. I. Chap. I).

Preliminary operative details. When the patient is fully anæsthetized the surgeon makes a median incision extending from just below the umbilicus to the symphysis pubis, and opens the abdominal cavity in the ordinary way. If the intestines be found adherent to the pelvic organs they should be gently separated with a gauze dab, or, when necessary, by putting the bowel on the stretch and cutting through the adhesions with scissors. The patient is then placed in the Trendelenburg position and the intestines are carefully packed off with

a sheet of thin rubber[1] which has been kept warm in hot saline solution. If necessary a gauze pack can be used subsequently against the rubber. A clear view of the pelvis is thus obtained.

If the tubes be adherent, as is always the case with infections, it is necessary first of all completely to free them and the ovaries, which will also be involved. Sometimes this is a very difficult matter, especially when the disease is of old standing.

In some cases it may be necessary to bisect the uterus in order to get at the adherent tubes from below, as recommended by Howard Kelly (see p. 252).

In the majority of cases, however, the operator is able without undue difficulty to 'deliver' the tubes and ovaries in the following manner:—

After the separation of any adherent bowel the fundus uteri is identified. In the worst type of case the posterior portion of the pelvis which lies behind the uterus and broad ligaments will be completely filled in with the adherent structures. The operator has therefore to make an opening for himself, and this is most easily accomplished if he force his index finger down the back of the uterus and keep the palmar surface of the finger against that organ. The hole thus made is widened from side to side until several fingers can be inserted.

The operator is now in a position to deal with the tubes and ovaries, which are adherent to the back of the broad ligaments. It is better first to deal with the right side, and then with the left which may be complicated by adhesions to the rectum. Passing three fingers into the wide hole at the back of the uterus the operator with the tips of his fingers scrapes the adherent tube and ovary from the back of the right broad ligament, and collects the organs as they are freed into the palm of his hand. The appendages are thus unfolded, as it were, from the back of the broad ligament.

Sometimes, of course, the vermiform process will be found in the pelvis on the right side and require to be freed previously to removal. As a rule this is easily accomplished.

The left tube and ovary are next separated in a similar manner, care being taken carefully to insinuate the forefinger between the rectum and the adherent appendages. If the bowel be torn it must be repaired immediately with catgut.

In milder infections the inflammatory process is limited to the neighbourhood of the tubes, and the pelvis is not filled in with exudate and adherent structures, so that it is a simple matter straightway to

[1] For some years the writer has used for packing off the intestines a sheet of rubber 60 inches by 12 inches, of the same thickness as that of a thin rubber glove. The endothelium of the peritoneum is not damaged by the smooth rubber as it is by gauze.

unfold the adherent appendages from the broad ligament in the manner described.

As a rule the bleeding from the raw surfaces is not great in infective lesions, and only a few points require to be caught and tied. Sometimes it is necessary to under-run with a needle and suture bleeding points which cannot be caught in the forceps. It is dangerous to leave clots in the pelvis lest they should become infected. With malignant disease the bleeding may be very troublesome, but must always be carefully arrested.

Suture and ligature materials. Catgut should be used for ligature of pedicles and isolated vessels, also to coapt surfaces when only temporary support is required during the process of healing. Fine twisted silk should be used when permanent fixation or the shortening of ligaments is required.

CHAPTER II

CONSERVATIVE OPERATIONS

DILATATION OF THE UTERINE TUBES

DILATATION of the uterine tubes is an operation which is performed to enlarge the lumen when this is slightly constricted.

Indications. This operation is but rarely performed, for there are no means whereby a slight congenital constriction or kink can be diagnosed.

In a few cases, however, of primary sterility the tubes have been investigated and found slightly stenosed or kinked, and dilatation has been carried out with successful results.

Technique of operations. **Instrumental dilatation.** The free margin of the mesosalpinx is seized in compression forceps and the tube to be dilated is put on the stretch. A small probe is then carefully passed through the abdominal ostium and on into the uterus. Great care must be exercised lest a false passage be made or the tube torn: any laceration of the lining membrane would probably be followed by atresia at the injured spot. Subsequently larger probes are passed until the operator is satisfied that there is no longer any obstruction.

This method has not been employed in a sufficient number of cases to justify any statement being made as to its value.

Pneumatic dilatation. This method has been employed by Hastings Tweedy, to whom the writer is indebted for a private communication on the subject. The free extremity of the mesosalpinx is seized in compression forceps and the fimbriated end of the tube exposed. The nozzle of a syringe containing sterile air is now inserted through the abdominal ostium and the piston of the syringe pushed home. By this means the tube is temporarily dilated, but according to Tweedy is liable to contract again.

No series of cases or the after-results have yet been published, so that it is impossible to say how far this procedure is justifiable or effective.

SALPINGOSTOMY

Salpingostomy, as its name implies, is an operation whereby an artificial ostium is made in the uterine tube.

Indications. This operation is performed, in circumstances to be mentioned directly, in order to cure the condition of sterility which is

associated with occlusion of the abdominal ostia. This, in fact, is the only indication for this procedure. It follows, therefore, that to justify the operation the patient must be in the child-bearing period of life, and that the local condition must be such that the artificial orifice will remain patent and the tube be functional otherwise.

With regard to the local condition, salpingostomy is only justifiable when the uterine end of the tube is patent. Consequently the operation

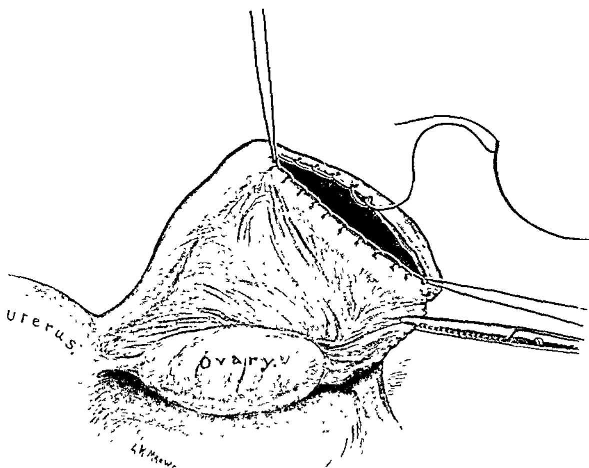


Fig. 99. Salpingostomy.

should rarely be performed for primary salpingitis, for in such circumstances the tube is frequently occluded at both ends and a hydrosalpinx or pyosalpinx is present or in the process of formation.

If, however, the infection have spread to the pelvis from the vermiform process the tubes may be buried in adhesions and the abdominal ostia sealed, while the uterine openings of the tubes remain patent, for, as a rule, in these cases there is no infection of the lining membrane of the tubes. The operation in such circumstances is carried out after removal of the vermiform process.

Technique of operation. The tube is carefully freed from adhesions and all bleeding completely arrested. This is a most important point: any blood in the neighbourhood of the artificial opening may give rise to further adhesions and close the orifice just made.

The tube is now brought out of the abdominal incision and put on the stretch by being held at the distal end or at the free edge of the mesosalpinx in a pair of compression forceps. The occluded end of the tube then is incised, and a probe or director passed into the lumen and on through the tube to the uterus, to make sure there is a free passage and no constriction which would prevent the ultimate success of the operation. If there be a slight stenosis this is carefully dilated with probes in the manner already described. Next, one blade of a pair of fine scissors is inserted along the probe or director, and an inch and a half of the distal end of the tube split open along the upper border. A temporary guy ligature is now placed at each end of the incision in the tube, and the lining membrane is sutured by means of a blanket stitch with very fine catgut to the muscular wall of the tube (Fig. 99).

It is rarely necessary to excise any portion of the wall of the tube, for after the stitching is completed the artificial ostium will be seen to gape owing to the retraction of the circular muscle fibres. Similar procedures are subsequently carried out on the other tube, if it be also sealed at the abdominal ostium.

The tube and ovary of the same side are finally fixed to the brim of the pelvis in the manner to be described directly. If no adhesions form, a functional tube will be obtained and a previously sterile woman may be rendered fertile.

FIXATION OF THE UTERINE TUBES

Indications. The tubes may be fixed in some more normal position when they are prolapsed with the ovaries into the pouch of Douglas with or without retroversion of the uterus If the uterus be retroverted also, then the cure of the tubal prolapse will form part of the operation for dealing with the displacement of the uterus. Prolapsed tubes may be free or adherent. The indications for operation when the tubes are free are pain in the back and dyspareunia, symptoms which are due to the associated ovarian prolapse rather than to the displacement of the tubes The ovaries, however, cannot be satisfactorily dealt with unless the tubes also are suspended in a normal position. The indications for fixing the tubes when adhesions are present are the symptoms already mentioned together with sterility. The operation is usually only performed in the latter class of case when the infection spreads to the pelvis from the vermiform process. The fixation may

in these circumstances follow the removal of the vermiform process and the performance of salpingostomy.

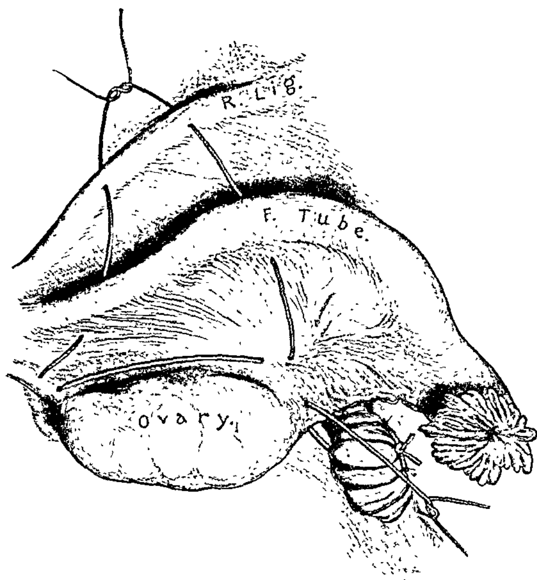


FIG. 100. SUSPENSION OF THE OVARY AND FALLOPIAN TUBE. The suture which puckers the infundibulo-pelvic ligament should only pick up the peritoneum, in order to avoid interference with the ovarian vessels. For the same reason the ligature which attaches the pole of the ovary to the infundibulo-pelvic ligament should not pass round this ligament, but through its peritoneal covering.

If the tubal infection be primary, fixation is rarely indicated, for some form of salpingectomy will probably be required.

Technique of operation. The following is the method adopted by the writer. The tube and ovary are first completely freed. The edge

of the mesosalpinx is then seized in compression forceps, and the infundibulo-pelvic ligament is shortened by passing a running stitch of fine silk through its peritoneal covering from the pelvic brim to the free border of the mesosalpinx, and tying the two ends of the thread together. Next the ovary is attached by the free border of the mesovarium to the shortened infundibulo-pelvic ligament at the brim of the pelvis. If the ovary be heavy and the mesovarium and mesosalpinx be much stretched, the ovary should also be fixed by a fine silk mattress suture which attaches the mesovarium to the mesosalpinx and the mesosalpinx to the round ligament of the same side (Fig. 100). In this way the tubes and ovaries are fixed above the raw pelvic surfaces, and remain free if the source of the infection be removed.

CHAPTER III

ERADICATIVE OPERATIONS

THE tubes are removed in the treatment of the following conditions:

Infections, new growths, tubal pregnancy, torsion, hæmatosalpinx, hernia, and ectopia.

There are various methods employed according to the condition present, so that it will be necessary to describe the simplest procedures first and afterwards the more extended operations that may be advisable.

It must be remembered, however, that the indications mentioned are only relative and not absolute, and depend on the conditions found. Further, removal of the tubes is sometimes only part of larger operations with which we are not concerned here.

SALPINGECTOMY BY SIMPLE LIGATURE

Indications. This method should only be employed in tubal pregnancy where the operation has to be performed rapidly, in torsion of the tube, in ectopia, and in hernia of the tube when it is considered advisable to remove the tube instead of returning it to the abdominal cavity.

Technique of operation. After the affected tube and corresponding ovary have been freed and delivered through the abdominal incision a double thread is carried through the mesosalpinx on a pedicle needle. One half is tied round the tube as near to the uterus as possible, and the other round the free edge of the mesosalpinx. Whenever possible the stump of the tube should be buried in the broad ligament, a procedure which does away with the possibility of a raw surface to which bowel may become adherent. The chances at some subsequent date of an ovum finding its way through the stump of a tube which is left exposed are too remote to need consideration.

Usually in the conditions mentioned the ovary will be removed at the same time for reasons which need not be given here. This involves a slight modification in the operation. The double thread is passed through the broad ligament below the ovary. One half is tied near the uterus to include the tube and ovarian ligament, and the other to include the broad ligament up to the infundibulo-pelvic ligament (Fig. 101).

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of the uterine cornu (Fig. 102). After the tubes have been removed in this way all bleeding points are carefully ligatured, and the cut edges of the mesosalpinx are sewn together. Finally the wound in the uterus is closed with a few deeply-placed catgut sutures.

In tubal pregnancy it is not really necessary to excise the tube from the uterus but it makes a neater operation.

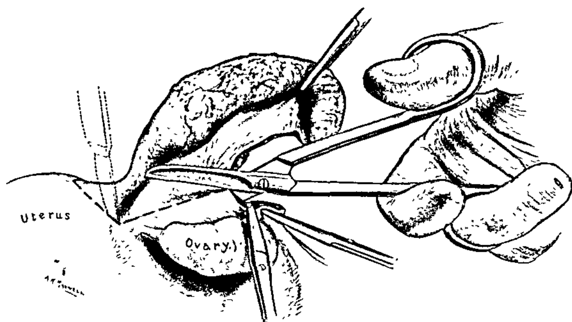


FIG. 102. SALPINGECTOMY WITH CONSERVATION OF THE OVARY.

ACROHYSTERO-SALPINGECTOMY

Indications. This procedure has recently been employed by the writer for infections of the tubes in young women where it is possible to save an ovary.[1] The essential feature of the operation consists in the removal of the fundus uteri together with both tubes and one ovary.

In these cases this procedure has the following advantages over the other forms of salpingectomy just described, which have hitherto always been employed either alone or with supravaginal hysterectomy: (1) Since the fundus is always infected removal of it is desirable to prevent the patient subsequently suffering from menorrhagia, as she frequently does after removal of the infected tubes alone. (2) If only the fundus and not the whole body of the uterus be removed, and one ovary be left, menstruation continues subsequently.

[1] Prof. Beuttner of Geneva has independently employed the same procedure. *Lancet*, 1913, Aug. 16, p. 483, and Aug. 23, p. 597.

SALPINGECTOMY BY EXCISION

Indications. This operation is employed in undisturbed tubal pregnancy, in innocent new growths of one tube, and sometimes in infections; but, as will be mentioned directly, the writer has recently devised a better method for dealing with infections involving the tubes.

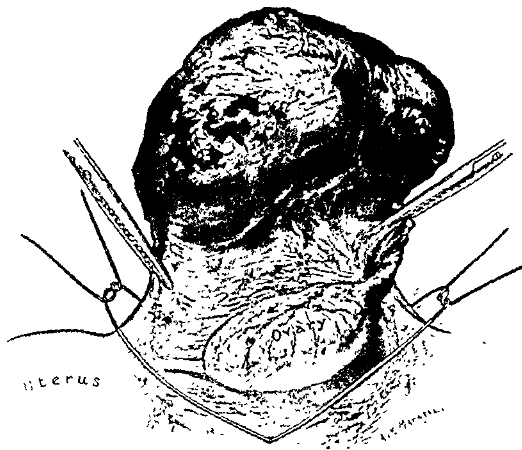


FIG 101. SALPINGO-OOPHORECTOMY A method employed when rapid removal is necessary in cases of tubal gestation.

Technique of operation. The free edge of the mesosalpinx, along which the ovarian fimbria lies, is seized with a pair of compression forceps and cut through. The mesosalpinx is now divided up to the uterus with scissors, bleeding vessels being caught in compression forceps as they are divided.

The tube is now quite free except for its attachment to the uterus and may be removed after simple ligature, which will include the main arterial supply from the uterine artery ; or by a wedge-shaped excision

of the uterine cornu (Fig. 102). After the tubes have been removed in this way all bleeding points are carefully ligatured, and the cut edges of the mesosalpinx are sewn together. Finally the wound in the uterus is closed with a few deeply-placed catgut sutures.

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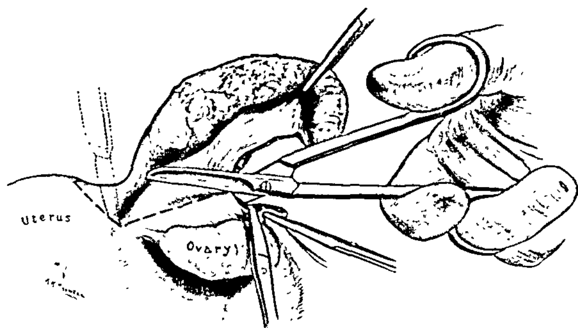


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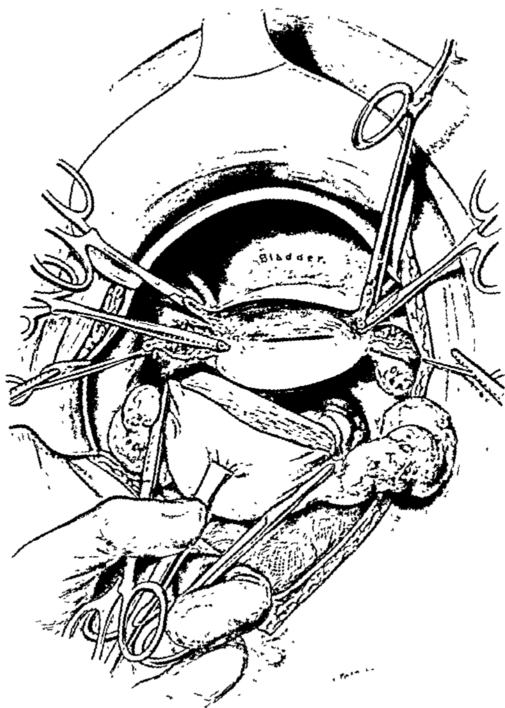


FIG 103 AUTHOR'S OPERATION OF ACROHYSTERO-SALPINGECTOMY. The stage in the operation is shown at which the tubes, one ovary, and the fundus of the uterus have just been removed

Technique of operation. After all adhesions have been broken down the operator excises the tubes and one ovary by cutting through the broad ligament on one side, and through the mesosalpinx on the side on which the ovary is to be left. Then, instead of excising only wedge-shaped portions of the cornua of the uterus, he excises the fundus uteri by anterior and posterior incisions directed from above downward and inwards. The ascending branches of the uterine arteries are caught at the side of the uterus below the angle made by the meeting of the incisions (Fig. 103). A wedge-shaped opening in the uterus remains with anterior and posterior flaps which are then sutured together to form a stump of the uterus containing some endometrium. The method of suture consists of the insertion of three or four mattress catgut sutures to coapt the deeper portions of the uterine wound and arrest the bleeding. The cut edges of the mesosalpinx on one side, and of the broad ligament on the other are then sewn together, and all ligatured stumps inverted between the two layers of peritoneum, with a continuous fine catgut suture, which also, as it passes from one side to the other, accurately coapts the peritoneal surfaces of the uterine wound.

Subsequently the uterine ends of the round ligament are sutured with fine silk to the top of the uterine stump, and the ligament of the remaining ovary is attached also by a fine silk suture to the round ligament of the same side to prevent the ovary from falling into the pouch of Douglas.

HYSTERO-SALPINGECTOMY

Indications. This operation, which includes the removal of the tubes with the uterus, completely or supravaginally, is employed in cases of retained menses in the uterus and tubes, in infections and in malignant new growths of the appendages.

As already pointed out, the operation of acrohystero-salpingectomy is to be preferred in salpingitis in young women when one ovary can be saved. But when both ovaries are removed because they are badly infected, or because the age of the patient is such (forty-five years and upwards) that it is not necessary to save an ovary, then, of course, it is useless preserving any endometrium, and supravaginal or complete hysterectomy should be performed. Similarly when there is a malignant new growth of the tubes or ovaries, both tubes, both ovaries, and the uterus should be removed.

Technique of operation. In an ordinary case in which there are no adhesions, or when they are only of moderate density, the commencement of the operation is carried out in the same manner as

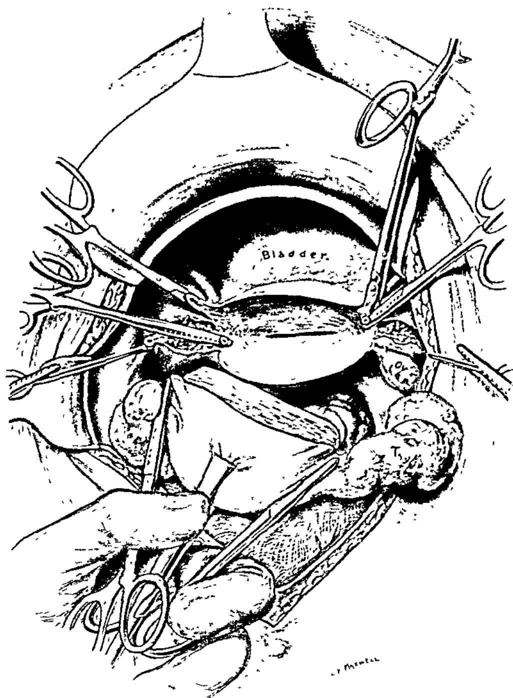


FIG. 103 AUTHOR'S OPERATION OF ACROHYSTERO-SALPINGECTOMY. The stage in the operation is shown at which the tubes, one ovary, and the fundus of the uterus have just been removed

abscess it should be drained through the posterior vaginal fornix, and the tubes removed subsequently by the abdominal route.

In the very rare cases in which drainage is necessary after laparotomy this should be carried out through a stab wound on one or on both sides outside the rectus muscle. By this means infection of the central wound, and the risk of a hernia subsequently can usually be avoided.

The difficulties of the operations are chiefly in connexion with adhesions and their separation. This may be specially difficult when the lesion is tuberculous. Injuries to bowel must be repaired immediately, but with tuberculous lesions a fæcal fistula—a most serious matter in these cases—almost always follows. Owing to the tendency to the formation of fæcal fistula drainage should never be employed in such cases. In an ordinary septic case, the bowel when torn can be effectively repaired, but drainage is practically never necessary.

in acrohystero-salpingectomy, but both ovaries are removed with the tubes, and instead of excising only the fundus uteri the operator removes the supravaginal portion or the whole uterus, and completes the operation of hysterectomy in the ordinary way (see p. 105).

In some cases of salpingitis, however, it is almost impossible to separate the adhesions from above without doing considerable damage to the rectum and pelvic walls. In these cases the uterus may be bisected, as recommended by Howard Kelly, from above downwards through the fundus, which is held by a volsella attached to each cornu. When the cervix is reached, each half of the uterus is amputated at this level by an incision running at right angles to the longitudinal one bisecting the uterus. A volsella forceps is now placed on the lowest portion of one half of the uterus. The operator then drags on the forceps in an upward and outward direction and exposes the uterine artery, which is seized in a pair of compression forceps. The round ligament and the tube on the same side are clamped, and one half of the uterus is removed. The same procedure is then carried out on the other side.

Sometimes the fundus is retroflexed, buried in adhesions and inaccessible. In such cases the cervix may be defined behind the bladder and divided. Next, the uterus is bisected from below upwards by passing the blade of a strong pair of scissors into the uterine cavity and first splitting up the anterior wall of the uterus and subsequently the posterior. Each half is then removed in the way described above. After removal of the uterus in one of these two ways, the pelvis is opened up and the appendages can be detached from below, as a rule without very great difficulty owing to the planes of adherence being exposed and to the greater amount of room provided.

DANGERS AND DIFFICULTIES OF OPERATIONS ON THE UTERINE TUBES

Both the dangers and difficulties are proportionate to the skill and experience of the operator.

The immediate dangers should be practically nil. The remote dangers are merely those of any abdominal operation.

In septic cases, of course, there are a few added risks, viz. the risks attendant on an abdominal infection, e.g. extensive peritonitis, thrombosis, embolism, septicæmia, pleurisy, cystitis, and other rarer complications. But, as a rule, the pus found at operation in cases of primary salpingitis is sterile, and drainage is unnecessary. If the operator refuse to operate on cases in an acute or subacute state there will be practically no mortality from this source. When there is a large acute peritubal

SECTION X

THE OPERATIONS FOR ECTOPIC GESTATION

BY

R. D. MAXWELL, F.R.C.S. (Eng.)
Assistant Obstetric Physician, to the London Hospital; Physician to Queen Charlotte's Lying-in Hospital

CHAPTER I

THE OPERATIONS FOR ECTOPIC GESTATION

THE operative treatment of this relatively common affection will depend very largely on its variety and the special evolution of the pregnancy: speaking generally, one may divide the fate of the ovum into several broad groups from the point of treatment.

1. *Early rupture* of a tubal sac, usually in the vicinity of the isthmus, when the patient's life is imperilled and prompt operative interference is called for.

2. *Tubal abortion*, where the symptoms are seldom so severe, frequently trifling, and neglected by the patient, who thinks she has had an early uterine miscarriage. Many of these cases do not require operative treatment: we know that many recover without it.

3. *Persistence of the pregnancy to between the third and fourth months*, when symptoms supervene suddenly. As a general rule, these cases represent primary ruptures of interstitial pregnancies, rudimentary cornual pregnancies, or secondary rupture of broad ligament pregnancies.

4. The very rare group of *ectopic gestations met with in the later months or approximately at full term.* No single operator has met with a sufficient number of these cases to enable him to formulate with precision definite lines of treatment, and in consequence there is considerable variance of opinion as to the precise time at which operations in this group should be carried out and the technique that should be adopted.

The sites of ectopic gestation calling for urgent operation will be ovarian, tubal, tubo-uterine or interstitial, intraligamentary and rudimentary cornual pregnancy.

THE OPERATION FOR EARLY RUPTURE OF THE GRAVID TUBE

All local physical signs may be, and indeed most frequently are, absent in this common variety. The diagnosis is first and last based on the classic signs and symptoms of internal hæmorrhage in a parous woman.

The common history is for several attacks of acute pain associated with fainting to have taken place before admission to hospital, where

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The common history is for several attacks of acute pain associated with fainting to have taken place before admission to hospital, where

often the patient is received in a moribund condition. Laparotomy with a view to hæmostasis is urgently indicated. If the case be desperate, not a minute more than necessary should be lost. Local anæsthesia of the belly-wall may expedite matters; in some successful cases no anæsthetic at all has been administered. A single application of a 2% alcoholic solution of iodine suffices to secure asepsis of the belly-wall.

Technique of the operation. The patient should be kept flat on her back. The Trendelenburg position merely invites the settling of large clots in the upper abdomen and possible delay in their removal at the end of the operation. The diagnosis is confirmed as the slate-blue peritoneum comes into view. A 4-inch incision should be made in the median line; the longer the incision (within limits), the quicker the operation No time should be wasted in evacuating the fluid blood and larger clots that well up, but the left hand should be plunged down in the median line so as to grasp and identify the fundus uteri and elevate it if possible to the wound-level above the effused blood. This will bring the isthmic portions of both tubes into view, for the gestation sac lies more probably here than elsewhere in the upper genital tract. Inspection of the sac is often necessary, for its small size (not greater than a pea in some cases) will escape detection by the gloved finger-tips. A pressure forceps is next placed one on each side of the gestation sac to control the medial ovario-uterine anastomosis and the lateral ovarian arterial supply, and the patient is at once secured from further loss of blood. It is a great mistake of technique to clear the operation field of blood by soaking it up with swabs and removing clots before effecting hæmostasis. In this way a few valuable ounces of blood may be sacrificed and a few equally precious minutes lost. The immediate bleeding being temporarily controlled by forceps, its permanent arrest is best secured by salpingectomy, with careful control of the medial blood-supply of the tube. It should be remembered that the patient is pulseless and complete cessation of hæmorrhage may appear to have taken place after the main blood-supply has been controlled; further oozing may, however, take place later when the blood-pressure rises, from the raw area left after the tube has been removed by snipping along the mesosalpinx close to its insertion in the tube. This area is therefore best controlled by a fine continuous whip-stitch suture. Larger clots can now be hurriedly removed and the belly closed as quickly as possible.

In no circumstances, where the corresponding ovary has not been encroached on by the gestation, should it be removed.

As long as the patient has a perceptible pulse on leaving the operating table (on which she should not have been for more than twenty minutes), there is every probability of her being out of danger in a few hours.

As a rule, in an hour's time the happy effect of salines and brandy per rectum is shown by the increasing warmth and improving volume of the pulse of the patient, and *a good prognosis may be given*. The convalescence of these patients is as a rule uninterrupted. A frequent transient rise of temperature up to 101°–102° on the second to the fourth day need not cause fears of sepsis. It is probably an expression of the absorption of fibrin ferment from the effused blood. Where the pregnancy is ovarian in site, operation is as a rule easy, the mesovarium alone requiring ligature. In many of the recent specimens the tube has been

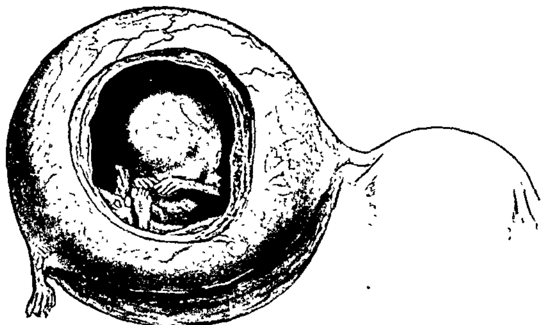


FIG. 104. TUBAL GESTATION PROLONGED TO AN UNUSUAL DURATION (4TH MONTH) WITHOUT RUPTURE OR ABORTION.

preserved, and unless it has been encroached on by the sac it should invariably be spared.

An embarrassing situation may be met with where the tubal gestation sac is situated directly on the insertion of the tube into the uterine cornu, and as a result of rupture the tear may have extended on to the cornu. Here the ordinary ligature on the medial or uterine aspect of the sac is not applicable. Even if a small portion of the cornu can be seen *medial to the sac, it is too near the site of rupture* for safe ligature, as the softened tissues allow the ligature to cut through with the slightest tension, and transfixing sutures merely invite fresh oozing. It is best in these circumstances to excise a small wedge-shaped area from the cornu with the tube and close the triangular area left by two or three sero-muscular sutures tied firmly without jerking; for it must be

remembered that the gestation sac leads to softening of all the tissues in the immediate vicinity.

As regards operation before rupture has taken place, this seldom falls to the lot of the operator, but it should be his duty, if he arrives at that diagnosis, to carry out an exploratory laparotomy. In a recent case of the author's in hospital this diagnosis was tentatively made, based on amenorrhœa and extreme pelvic pain. Pelvic examination was easy, and the uterus and appendages could be felt with ease without anæsthesia. No abnormal tubal physical signs were detected, and in consequence appendicitis was suggested and the case transferred to a colleague. Two days later he operated and removed a right gravid tube with a leaking sac the size of a walnut. There is little doubt that the first examinations conducted had caused a slight leak in the sac, and this point must be borne in mind where bimanual examinations are made in a suspicious case, for not infrequently symptoms of grave hæmorrhage rapidly supervene on the examination.

OPERATIONS FOR ECTOPIC GESTATION IN WHICH GRAVE SYMPTOMS ENSUE BETWEEN THE THIRD AND FOURTH MONTHS

This chiefly concerns (*a*) secondary ruptures of broad-ligament gestation sacs, (*b*) rudimentary cornual pregnancies, and (*c*) interstitial pregnancies.

(*a*) *Secondary rupture of broad-ligament pregnancies at the third to fourth month.* In these cases there is always more disorganization of the appendages, and anatomical relations are not so easily identified. The source of the hæmorrhage cannot readily be localized: it may present itself as a large oozing area on the floor and side of the pelvis or lateral uterine wall.

The belly is to be opened promptly: the affected appendages are easily recognized, and as a rule a fœtus (at least 2 to 3 inches in length) quickly comes into view, since it has escaped from the rent in the sac-wall. The affected broad ligament should be elevated to the wound-level and as much of the placental tissue and fœtal envelope removed as possible. This as a rule comes away easily. There now remains a large oozing area to be controlled. If the hæmorrhage is very severe, the main blood-supply of the area should be controlled by ligature of the ovarian artery at the infundibulo-pelvic ligament and the uterine anastomosis at the cornu A swab rung out of hot saline solution may be in the meanwhile packed down on the pelvic floor. If bleeding still continues after the main blood-supply has been secured, search for its source should be continued lower down in the wound: it may be coming

from the uterine artery on the wall of the uterus or more laterally on the pelvic floor; all small bleeding points must be controlled. It is seldom necessary to pack the floor of the pelvis with gauze in these relatively early cases, but experience alone will teach the operator what degree of oozing or what extent of raw oozing surface he can safely leave when he closes the abdomen. Temporary pressure, during the late stages of the operation, with swabs wrung out of hot saline solution at a temperature of 115° F. is, as a rule, effective.

In some of the more severe cases where oozing from a large surface in the floor of the pelvis is formidable and the operator feels it unsafe to close the abdomen without further attempts to arrest it, he can open the posterior fornix from the vagina and bring out the end of a gauze drain which has been packed down firmly over the bleeding area.

(*b*) *Rudimentary cornual pregnancy.* This variety of ectopic gestation is seldom recognized before urgent symptoms of bleeding show themselves, and the diagnosis is as a rule established only after laparotomy. The deviation of the normal half of the uterus to its corresponding side is seldom absent and should suggest the condition to the surgeon. (See Fig. 105.) The diagnosis would rest upon the presence of a soft cystic para-uterine gestation sac. The uterus may be recognized as a solid organ not proportionably increased to a size corresponding to the period of amenorrhœa. Hegar's sign would not be obtained on grasping it bimanually; as a rule the sound will rightly not have been employed in these cases, since intra-uterine pregnancy is almost inevitably diagnosed. Uterine pregnancy complicated by an ovarian cyst (possibly twisted) simulates the condition exactly and is the chief differential diagnosis.

Bleeding from the decidua of the unimpregnated uterus again confuses the clinical picture. The hæmorrhage that ensues on rupture of these sacs is literally that from a ruptured uterus. A large number of the museum specimens are obtained from the dead-house and attest the severity of the bleeding unless surgical interference is of the promptest.

Where operative interference is timely the technique is extremely simple. The para-uterine sac (as seen in Fig. 105) is connected on its mesial aspect with the uterus by a thin fibro-muscular septum, for the most part bloodless. The blood-supply lies wholly on the lateral aspect of the sac and reaches the sac through a mesometrium. This can be easily secured by a couple of clamps and the sac removed without further blood loss, since the vascular supply (ovarian and uterine arteries) is at once secured. In the case illustrated in Fig. 105 the patient owed her life to dense adhesions of bowel and omentum forming a spurious

capsule roofing in the leaking sac from above. Symptoms of leakage had existed for about twenty-four hours before admission, and but for these adhesions a rapidly fatal inundation of the peritoneal cavity with blood would have ensued.

(c) *Interstitial pregnancy.* In these cases the sac is so intimately in relation with the uterus that a conservative operation (preservation of the uterus) cannot be effected. The most rapid form of removal of the uterus—supravaginal hysterectomy—is the treatment recommended.

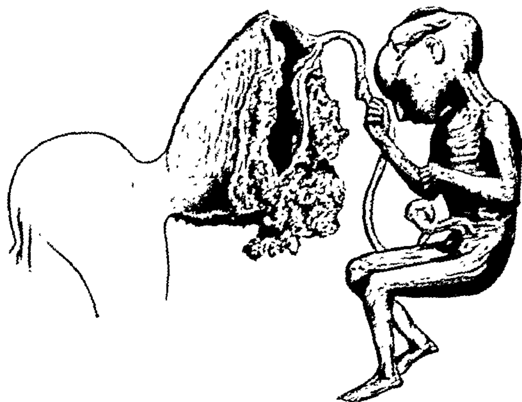


FIG. 105. RUDIMENTARY CORNUAL PREGNANCY This was followed later by normal pregnancy and labour in the uni-corn uterus.

In the case illustrated in Fig. 106, the surgeon has been fortunate enough to operate before rupture of the sac. The indications were, very severe pain, in the presence of signs and symptoms of pregnancy, with a tender mass in relation to the uterus, thought to be either a twisted ovarian cyst or a tubal gestation.

This variety of gestation sac, situated as it is in the uterine wall, is capable up to a very considerable degree of hypertrophy and dilatation of its walls. Diagnosis of this variety of gestation sac is made by inspecting the relation of the round ligament after the belly has been opened. The round ligament is inserted directly on to the sac. These

pregnancies are frequently continued without untoward results up to the fourth month of gestation, when thinning and rupture of the sac inevitably take place. The rupture may proceed in two directions, either into the uterine or peritoneal cavity, and frequently in both directions.

Bleeding is necessarily severe from the ruptured uterus and fatal consequences the rule.

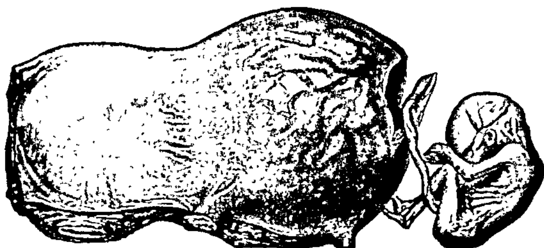


FIG. 106. INTERSTITIAL PREGNANCY.

OPERATIONS FOR ECTOPIC GESTATION IN THE LATER MONTHS OF PREGNANCY

It is here that there is the greatest divergence of opinion as to the time when operative interference should be undertaken. Should the operator delay with a view to obtaining a viable child at term by laparotomy? Should he operate at once with a view to avoiding the risks of delay, which are great, for grave hæmorrhage may at any moment ensue from the placental site if it lie superior to the fœtus? Should he await the onset of full term and spurious labour with the consequent death of the fœtus and the avascularization of the placenta, which will reduce the risks of hæmorrhage during operation and facilitate the immediate removal of the placenta? The records of these cases prove that no definite general pronouncement can be made on these points, for everything will depend on the situation of the placenta, the nature of its vascular connexions, and whether the placenta is 'dead' or 'living', facts which can alone be determined after the belly has been opened. Thus if the placenta be situate below the fœtus and intimately connected with the pelvic floor or its lateral walls, when separated its oozing site

capsule roofing in the leaking sac from above. Symptoms of leakage had existed for about twenty-four hours before admission, and but for these adhesions a rapidly fatal inundation of the peritoneal cavity with blood would have ensued.

(c) *Interstitial pregnancy.* In these cases the sac is so intimately in relation with the uterus that a conservative operation (preservation of the uterus) cannot be effected. The most rapid form of removal of the uterus—supravaginal hysterectomy—is the treatment recommended.

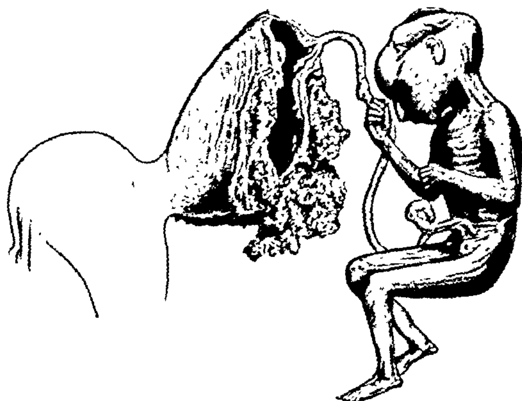


FIG. 105. RUDIMENTARY CORNUAL PREGNANCY This was followed later by normal pregnancy and labour in the uni-corn uterus.

In the case illustrated in Fig. 106, the surgeon has been fortunate enough to operate before rupture of the sac. The indications were, very severe pain, in the presence of signs and symptoms of pregnancy, with a tender mass in relation to the uterus, thought to be either a twisted ovarian cyst or a tubal gestation.

This variety of gestation sac, situated as it is in the uterine wall, is capable up to a very considerable degree of hypertrophy and dilatation of its walls. Diagnosis of this variety of gestation sac is made by inspecting the relation of the round ligament after the belly has been opened. The round ligament is inserted directly on to the sac. These

spaces of the fœtal envelope: sometimes the hæmorrhage into the fœtal tissues is limited to this area, the amniotic cavity is preserved though encroached on, and when the mole is opened it presents the typical nodular appearance known as the 'Tuberose sub-chorionic hæmatoma mole' (Bland-Sutton).

Pelvic hæmatocele. Blood thus escaping from the ostium in the course of tubal abortion accumulates at the lowest level of the peritoneum in Douglas's pouch, where it is rapidly encysted from the general cavity by adhesions of omentum and small and large bowel to the fundus and back of the uterus. With increasing tension due to slow continuous oozing from the ostium, the roof of the sac may give way and the collection of blood cease to be encysted. This result may sometimes be seen to have taken place where the patient has been examined bi-manually prior to the operation; investigation should therefore be conducted as carefully as possible.

Peritubal hæmatocele. The blood escaping slowly from the ostium may sometimes coagulate without forming adhesions to contiguous viscera, and form a rounded elongated mobile tumour simulating an ovarian cyst or hydrosalpinx. This tumour is formed by coagulated blood and its outer layers are composed of dense laminated fibrin, the central core, where the bleeding is more recent, being softer and composed of fluid.

Para-tubal hæmatocele is the name given to a similar collection of coagulated blood where the hæmorrhage is proceeding from a rent in the tube and a blood-tumour is formed alongside the tube. It is a rare condition.

Differential Diagnosis. The most difficult differential diagnosis is the early stage of a subacute attack of perimetritis and in a doubtful case every possible attempt should be made to exclude this affection. This is of the highest importance to the welfare of the patient where an attack of perimetritis so often undergoes wellnigh complete resolution with restoration of function, operative interference during a first attack being contra-indicated. Much assistance can now be rendered by testing the patient's blood for the presence of Abderhalden's delicate peptone reaction which is specific for pregnancy. The technical difficulties of this test are being overcome, and most of the pathological laboratories will shortly be able, we hope, to pronounce with confidence on the presence or absence of pregnancy. Pyrexia frequently accompanies both perimetritis and tubal abortion, and may prejudice the diagnosis in favour of the inflammatory cause. It is essential that thorough investigation of the lower genital tract should be carried out with a view to the detection of signs of previous ascending infection. Thus the urethra, the

is amenable to firm packing with gauze from above. If, on the other hand, the fœtus be developing in the broad ligament as a retro-peritoneal pregnancy with the placenta situated above the fœtus, in the course of development it will continually be dislocated and acquire fresh adhesions to and an intimate blood-supply from the bowel (both small and large). These are the cases where immediate separation of a 'living' placenta (after removal of the fœtus) is wellnigh impossible owing to the danger of wounding gut, while leaving it behind invites an infection from the contiguous bowel which is the greatest source of danger next to fatal hæmorrhage.

Weighing all these points against each other, and accepting the evidence of statistics, it would appear that delay in operation is not justifiable, that laparotomy should be undertaken at once without regard to the viability of the fœtus, and that every effort must be made to remove the living placenta with avoidance of injury to delicate contiguous structures such as bowel. As far as possible, main blood-vessels must be ligatured before effecting the placental separation. This will obviously be an easier matter where the placental site is pelvic, but may be impossible where the main placental blood-supply is mesenteric. In these cases the operator has often been forced to leave the placenta *in situ* after the sac has been 'marsupialized', its edges being sewn to the edges of the abdominal wound with the view to localizing the almost inevitable sepsis that will attack the disintegrating placenta.

OPERATIONS FOR TUBAL ABORTION

Generally this form of termination of ectopic pregnancy (tubal abortion) occurs when the ovum is lodged in the outer (cœlomic) half of the tube, and the closer to the ostium the ovum is embedded, the greater the ease and the greater the probability of its complete expulsion.

Hæmorrhage takes place in several situations at this stage, the more severe being due to an internal laceration of the tube, the blood effused round the ovum bursting back again into the lumen of the tube which the ovum had previously quitted on embedding itself. If this hæmorrhage completely surround the ovum it will be stripped all round its periphery from the tubal site and find its way back through the internal site of rupture into the lumen. Hence it is propelled towards the ostium by a combination of reverse tubal peristalsis and pressure behind it of outpoured blood. If the rent in the inner lining of the tube be not too severe, and the ovum completely aborted or extruded from the ostium, there is every reason to believe that the bleeding will cease spontaneously.

The other plane of hæmorrhage is situated in the chorio-decidual

(b) *Where increasing pallor and raised pulse-rate point to continued bleeding.*

This will usually point to failure of encystment of the collection or a leakage from the roof of the sac which may be associated with rapid onset of grave signs of hæmorrhage.

(c) *Where the level of the roof of the hæmatocele is slowly rising in the hypogastric area and attains more than two to three fingers' breadths above the pubes.* This obviously points to a large collection of blood with continued oozing.

(d) *Where the collection of blood is large enough to produce such a degree of pressure on the neck of the bladder and urethra as will lead to retention of urine.*

(e) *Signs of pyrexia or toxic symptoms accompanied by local changes in the hæmatocele pointing to its infection from the bowel.* This complication is, however, very rarely seen.

Technique of operation. Should the vaginal or abdominal route be selected? There is much to be said in favour of the former route though it is by no means frequently practised at the present time. Its disadvantages are the limited information it provides as regards the condition of the opposite appendages. Very much in its favour is its ease and the rapid convalescence that follows a favourable case.

Vaginal route. All that is required is local disinfection of the vagina and an incision in the posterior fornix.

The posterior lip of the cervix is seized with a volsella, which is drawn forwards and upwards, thus putting the posterior vaginal wall on the stretch. The vaginal mucosa is now picked up with a toothed forceps 1 inch below the fornix, and between this forceps and the vaginal portion of the cervix the mucosa is incised in the median line with scissors in a horizontal direction for 1 inch. The peritoneum of the floor of Douglas's pouch now comes into view and is similarly incised, and the opening, if necessary, enlarged with the finger. Firm dark blood-clot escapes, and the cavity can be drained for three days by a stout rubber drainage tube, or if oozing is severe, packed with gauze, which can be wholly removed in the same number of days. The immediate results of this posterior colpotomy are remarkably successful, the sole criticism against its routine use being the inability accurately to inspect the condition of the opposite appendages except in very exceptional cases.

Abdominal route. After opening the abdominal cavity, the upper margin of the hæmatocele roofed in by omental and bowel adhesions is easily seen below and behind the uterus but often roofed in by the uterus itself.

The plane of cleavage in this area of adhesions can as a rule be

bulbo-urethral ducts (Bartholin's ducts) and the cervical mucosa should be carefully examined, and in doubtful cases a 'smear' prepared with a view to detecting the presence of the gonococcus.

Physical signs of pelvic hæmatocele. By the abdomen, in a typical case of a fairly large effusion of blood, the small unappreciably enlarged uterus can be made out as a nodular mass pressed close against the hypogastric wall a couple of inches above the pubes (the uterus has been pushed forwards and upwards by the large collection of blood-clot below and behind in Douglas's pouch); on vaginal examination the cervix is drawn up almost out of reach of the finger-tip, while the posterior fornix is depressed by a soft semi-fluctuating swelling (the lower pole of the blood coagulum). This displacement of the cervix associated with a depression of the posterior fornix and posterior vaginal wall resembles strongly the physical signs of incarcerated gravid uterus. The recognition of the uterus above and in front settles the diagnosis.

Indications for operation. It has been stated that the difference between the expectant attitude and operative interference in this affection is that between three months enforced rest and three weeks in bed after a laparotomy. This statement would seem to imply that after operation the patient would resume an active life within a month—a post-operative history which is neither probable nor advisable. The balance of opinion is very much in favour of operation. In support of this view are the following :—

(*a*) There is always an uncertainty as to whether the ovum has ceased to grow or still retains its active powers of invasion unimpaired.

(*b*) The pregnancy may be an intra-ligamentous one with probabilities of later secondary rupture.

(*c*) Possibilities of development of malignant properties of the fœtal epiblast (chorio-epithelioma).

(*d*) The integrity of function of the opposite tube may be gravely impaired; the plastic peritonitis engendered on the pelvic floor may lead to closure of the ostium of the non-gravid tube with subsequent sterility. For this reason operation in a primagravida would be more strongly recommended.

Against these points one must not lose sight of the fact that a large number of these cases recover without operation; were there more definite records of parity following the expectant treatment we could pronounce more confidently on this point.

Apart from these general *reasons* operation may be said to be specially indicated in the following circumstances :—

(*a*) *Where pain is severe and unrelieved by ordinary measures,* this implies increasing tension in the sac caused by continued oozing.

SECTION XI

OPERATIONS FOR PUERPERAL SEPSIS

BY

A. W. W. LEA, M.D. (Lond.), F.R.C.S. (Eng.)

Surgeon, Northern Hospital for Women and Children, Manchester; Assistant Surgeon, St. Mary's Hospital, Manchester

recognized at once. The index finger is gently inserted along it, keeping close to the posterior uterine wall: as soon as the separation of adhesions along the roof is effected, black blood-clot wells up and reveals the encysted cavity whose floor is Douglas's pouch. The cavity is opened up as widely as possible and search made for the affected tube. The side of the gestation sac can generally be seen from above by the dilatation of the affected tube, which is as a rule raised with ease from the pelvic floor, and inspected. The ovum is often seen in the act of escaping from the dilated ostium. More often the tubal ostium is patulous, the ovum having been expelled from the tube. Next, see if the corresponding ovary can be identified free of the gestation sac: if so, it must be preserved: if encroached on and disorganized, it must be removed with the tube. Salpingectomy alone must, however, always be aimed at.

After removal of the affected tube, examine the opposite tube. Its ostial fringes may be adherent and the lumen occluded as the result of the reactionary pelvic inflammation induced by the irritation of the effused blood. Before closing the abdomen the operator should always, therefore, satisfy himself of the functional integrity of the remaining tube, and if necessary restore its patency either by reopening its ostium or carrying out the operation of salpingostomy. It is to be hoped that in the future there will be records of even more conservative technique than this in favourable cases. Where the ovum has completely escaped from the ostium, where there is little damage to the tube, and where there is no further bleeding from the tube under inspection, there is every reason to believe that freeing adhesions and removing the blood-clot is all the surgeon need do, for the tube in all probability is capable of regaining its normal function.

CHAPTER I

THE OPERATIONS FOR INFECTIVE METRO-PHLEBITIC PUERPERAL THROMBOSIS

HISTORY OF THE OPERATION

THE operation of ligaturing the pelvic veins in cases of infective thrombosis was first performed by Freund in Germany in 1897. He ligatured thrombosed ovarian veins in two cases, but without success.

Trendelenburg, in 1902, ligatured the veins in four cases of acute pyæmia. These, he states, were all associated with lymphatic infection and terminated fatally.

In 1905, Bumm, of Berlin, published a paper on the subject and related a history of five cases of chronic thrombo-phlebitic infection, in *which he had ligatured the pelvic veins, with three recoveries.*

Since this period many cases have been published by Haeckel, Lenhartz, one case by Cuff, Whitridge Williams, and others.

It is probable that other cases of this type have been operated upon without the results being published.

METHODS OF OPERATION

The Extra-peritoneal Abdominal Operation. This procedure is carried out by making a curved incision, laterally, inside the inguinal ligament (Poupart's), dividing the muscles and fascia and reflecting the peritoneum in order to expose the iliac veins.

Thrombosis of the veins may thus be recognized, though it is extremely difficult to pass a ligature above the thrombosed part. The ureters may also be in danger of injury, unless carefully separated from the iliac vessels.

Of the fifty-six cases of operations for infective thrombo-phlebitis, published up to May 1909, fifteen cases were operated upon by this method ; only three recovered.

This shows a mortality of 80 per cent., but if five acute cases operated upon by Trendelenburg and Lenhartz, one case of Michel's, and one of Bland-Sutton's, which was complicated by peritonitis, are deducted, it is clear that there were three recoveries in nine cases of chronic pyæmia. This reduces the mortality to 66 per cent.

Intra-peritoneal operations. The intraperitoneal gives much better results than the extra-peritoneal method, and is generally advocated by all who have had experience of the operation.

A median incision is made in the abdomen, the patient being placed in the elevated pelvic position. The intestines are kept out of the way by

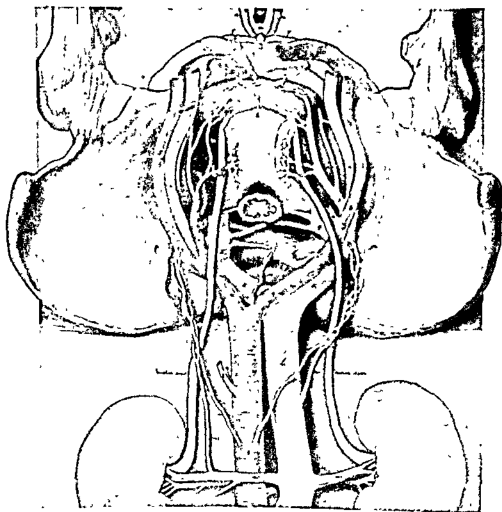


FIG. 107 THE VEINS OF THE PELVIS AND POSTERIOR ABDOMINAL WALLS.

introducing a roll of gauze into the abdomen. A clear view can thus be obtained of the condition of the uterus, broad ligaments, and the appendages.

The internal spermatic veins can be brought into view by reflection of the peritoneum covering them.

If the vein on either side is thrombosed it is advisable to ligature it well above the thrombosed area without excising it.

Exceptionally, puriform softening takes place in the thrombosed vein.

This portion of the vein should be excised in order to avoid any risk of the further spread of infection.

By this route also the condition of the hypogastric and external iliac veins can be seen. For the exposure of the hypogastric veins it is necessary to find the corresponding artery.

The ligatures should be passed as closely as possible to the common iliac vein. If, as is not uncommon, the median iliac vein exists, this should also be ligatured at its union with the external iliac vein.

Experience has shown that it is rarely advisable to excise the veins. Ligature of the vessels above the thrombosed area is preferable.

In all these operations great care must be taken to avoid injury to the ureters.

The question of undertaking the operation for ligature of the pelvic or spermatic veins must be decided mainly by the general condition of the patient. If peritonitis exists operation is contra-indicated.

There is often much difficulty in inflammatory cases in completely exposing the iliac veins. It is doubtful if it is advisable to ligature the common iliac vein in these circumstances. This was performed successfully by Bumm in one case.

It has been noted by those who have ligatured both hypogastric veins (Bumm, Haeckel, and Fromme) that the external genital organs become œdematous for a few days, but that, before long, a collateral circulation is established.

The prospects of cure by ligature of veins are undoubtedly much better in the chronic than in the acute forms of infective metro-phlebitic thrombosis.

If the operation is successful the results are often good. Rigors may cease almost at once, or within two or three days.

RESULTS OF THE OPERATIONS

In reviewing the results of the intra-peritoneal method of performing these operations, Whitridge Williams analysed, in May 1899, forty-one cases, in which the total mortality amounted to 43·9 per cent.

This list included many cases operated upon for acute pyæmia; the operations being incomplete, Whitridge Williams regards twenty-eight cases only as affording sufficient test as to the value of the operation. In this series, six only died, thus showing a mortality of 21·4 per cent.

Of twelve cases in which the thrombosis was limited to one or both spermatic veins, one only terminated fatally.

He also publishes the details of sixteen cases in which one or both hypogastric veins were ligatured together with the spermatic veins. The mortality in this series was 31 per cent.

During the last three years operations have been performed in Germany and America, and seventy to eighty cases have now been published. Many of these were of a severe type and the mortality is still about 40 per cent. with 60 per cent. of recoveries.

The present position of the operative treatment of thrombo-phlebitic infection may be stated as follows :—

1. This operation is not suitable for cases of acute pyæmia.

2. The operation is contra-indicated in lymphatic types of infection.

3. The majority of cases which have recovered are those of the sub-acute type of thrombo-phlebitic infection following either abortion or full-term labour, which are operated upon not later than three or four weeks after delivery.

4. If any indication of thrombosis of the common iliac vein exists, operation is contra-indicated, as there is a great tendency of extension of thrombosis to the inferior vena cava, which is always fatal.

5. The abdominal method of operation is far more efficient than the extra-peritoneal route, as it affords a clear view of the condition of the pelvis.

6. The operation should be undertaken as soon as a probable diagnosis can be made of the presence of thrombo-phlebitis.

7. The vaginal route has been adopted by Taylor, Latzo, and others, but, as it is impossible to make a diagnosis of the site of the thrombosed veins, this method has been given up.

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